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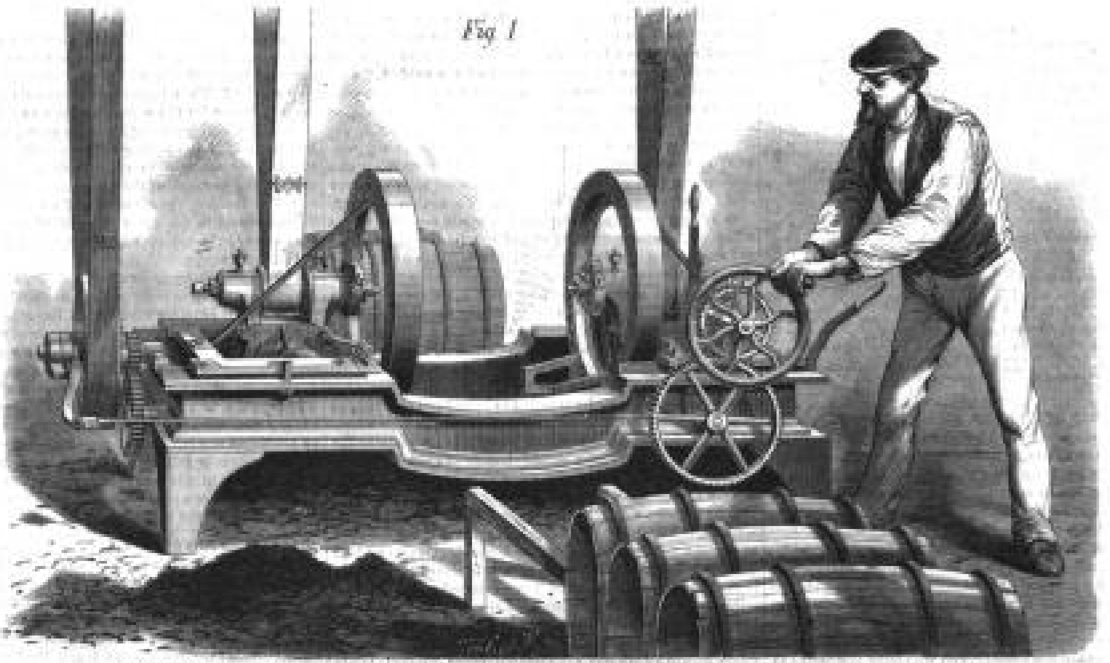
Fig 1

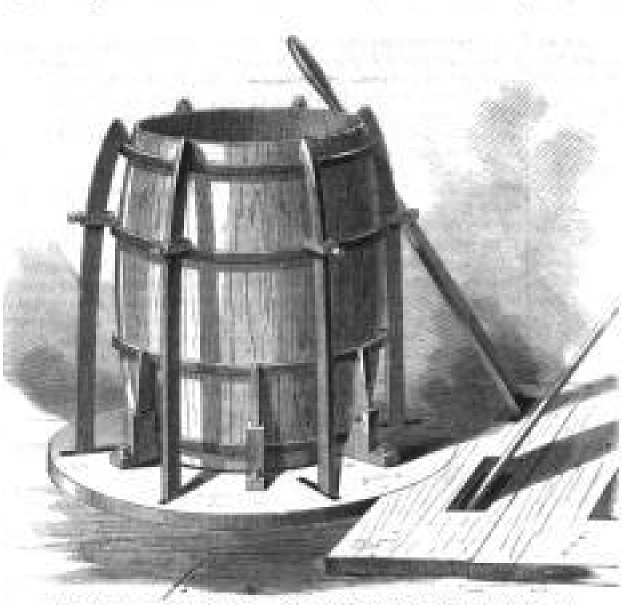


HOLMES' BARREL MAKING MACHINERY.—THE CHAMFERING AND CROZING MACHINE.

HOLMES' IMPROVED BARREL MAKING MACHINERY.

Our readers, and especially those interested in the manufacture of barrels, or who use the article to any great extent in their various callings, are doubtless aware that, not long since, strikes of considerable magnitude occurred among the coopers of this State. These movements owed their origin, among other causes, to the introduction into the market and use, by barrel manufacturers, of improved machinery by means of which the labor of skilled mechanics was, in a large measure, dispensed with, and the work readily accomplished by ordinary day laborers. The point maintained by the coopers was, first, direct opposition to the machines as a substitute for hand labor; but this position they afterwards abandoned, and fell back on the demand that they, and not men out of the trade, should be employed to run the shops. The question in some localities is still at issue; but in others, and especially in the manufactory which we recently had occasion to visit, the employers have prevailed, and are consequently carrying on their business with both a decrease in expenses and an increase in the quantity of their products. We allude to these uprisings, in the present connection, not to discuss their merits or demerits, but as a point of interest in reference to the machines represented in our engravings, which are the principal devices which have already caused in a certain degree, and we do not doubt are in the future destined to effect, an important revolution in the coopers' trade.

We recently devoted a few hours to the inspection of the barrel factory attached to the extensive sugar refining works of Messrs. Havemeyer & Elder, in Brooklyn, our object being to examine the operation of barrel making as performed by the machinery we are about to describe. With the superintendent of the establishment as a guide, we were conducted through various rooms heaped to the beams with thousands of bundles of staves and hoops, across courtyards, and, finally, into the long apartment which formed the principal shop. We cannot describe the noise which saluted us as deafening, for the word fails to express it; it was equal to that of a regiment of boiler riveters, and worse than a few dozen steam hammers, so that remarks of an explanatory nature were out of the question, or else were imparted by the aid of pantomime. Picking our way between belts, and dodging the barrels which were constantly flying about the room, we reached a workmen were busily at work setting up the barrels before delivering them to the machinery. The setting up form is composed of two heavy circles of iron, secured together and bolted to the floor; from these rise short standards which support a hoop. The staves are set in between the iron circles, and fitted carefully together. The iron truss hooks, which are previously placed in proper position, are lifted up by hand so as to embrace the lower portions of the staves and hold them in place, when the whole is lifted out of the frame. One half the barrel is now tightly held together, but the remainder was still open and flaring. To secure this in similar manner, a rope was passed around the flaring ends and taken to a hand windlass, a few turns of which brought the staves together, when the truss hoops were slipped over the extremities, and the barrel was ready to be heated in order to cause its staves to assume the curved shape. The heaters were simple iron cylindrical stoves, over with a sheet iron cover, which was let down from above. Here the wood was well warmed through.



BARREL MAKING.—Fig. 2.—THE TRUSSING MACHINE.

The leveling machine, to which the cask first passes, is a simple contrivance, the construction of which will be readily followed from our illustration (Fig. 3, on page 194), little explanation being necessary. Its object is to bring the cask into a shape that, when on end, it will stand in a perpendicular position and not lean in any direction. The barrel is placed between the two disks shown, where it is held by the projections on the inner faces of the latter. As we looked on, a workman moved the handle, a clutch was thrown into action, and the right hand disk quickly advanced, powerfully compressing the cask. There was no blow or jar; and in less time than we have taken to pen the words, the barrel was out of the machine, perfectly leveled and true. From three to four hundred casks per hour, we were told, could be thus manipulated.

Following our barrel, as it went rolling across the room, we next found it placed on end, and in the clutches of a number of hooked bars which protruded up through the floor, as represented in Fig. 2. The longer arms just caught above the upper truss hoops, and sliding collars on them similarly caught on the second bands. The lower hoops were pressed against notched standards, which also stood up from the floor, but did not pass through the same. The long arms, as we came to the machine, were spreading themselves outwards and apart, and at this moment the barrel was inserted. Then, as they came together, they caught the hoops in the manner above stated, and pulled down, dragging the heavy iron rings over the more bulging portion of the cask, and of course wedging them on the more tightly. The same effect was produced by the stationary short lower standards, by their resistance to the lower hoops moving as the barrel was forced down. The simple mechanism which actuated this device, we found located in the collar. It is a screw suitably connected with reversible gearing, the latter being governed by the lever handle shown in the engraving.

The machine, we noted, was operated by a single man and with great ease. A very strong power was brought to bear on each hoop, which thoroughly trussed the barrel with remarkable rapidity. We were informed that, although we saw it operating on slack work, which, such as sugar barrels are termed, it was equally efficacious in trussing stray or

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Contents:
(Illustrated articles are marked with an asterisk.)

THE POST OFFICE AND THE TELEGRAPHS.

Shall we have a postal telegraph? Excepting the financial policy of the nation, this is perhaps the most important question just now before the country. Certainly there is none involving results more far-reaching or significant.

As the matter stands, the parties to the discussion are, roughly speaking, these four:

1. The Postmaster General, and those interested with him in extending the scope and authority of the postal department, either for personal and political ends, or from a sincere desire to cheapen the telegraph and extend its facilities to all parts of the country.

2. Certain capitalists, who wish to monopolize the telegraphic business of the country, and who offer low tariffs in return for the privileges of monopoly, free offices, freedom from taxation and other substantial benefits.

3. The telegraph companies, which are naturally opposed to any measures likely to lessen the value of the properties they have acquired, or take from them the business they have built up.

4. The users of the telegraph, who so naturally desire the quickest, cheapest, and trustiest means of communication attainable, caring little whether it is the result of public or private enterprise, so long as the system is self-supporting and reasonably free from financial or political risks.

The arguments of those who would have the general government take possession of the telegraphs are somewhat diffusely presented by the Postmaster General. Critically examined, they appear to be neither very numerous nor very cogent. Chief among them is the assertion that the government could and would largely reduce the cost of messages, and at the same time extend the lines to parts of the country not likely to be reached so long as the telegraphs remain under private management. As Mr. Creswell puts it, the telegraph now follows the march of civilization, but does not lead it. Why it should not do so he neglects to say, assuming, as not to be questioned, the theory that the telegraph is an educator which the government should give the people whether they are conscious of needing it or not, trusting to their future enlightenment to make business enough to render the system profitable. As an aid to this beneficent work, a low and uniform tariff would of course be exceedingly potent.

In addition to their neglect to do missionary work by extending their lines faster and farther than there is a paying demand for telegraphic facilities, the telegraph companies consult their own interest in preference to that of the public at large in fixing their charges for service. These the Postmaster General characterizes as exorbitant, and aggravated in many cases by enormous charges for the delivery, the lack of restraint upon the companies in this matter being "perhaps the greatest evil of the American system." And even if the rates are reduced from time to time with the increase of business, the good effected, we are told, will be more than counterbalanced by evils inevitably attendant upon private management, such as the possible abuse of the wires for personal ends by the men controlling the business, the discrimination made between the messages of different customers both as to cost and order of transmission, the enormous and dangerous extent of the free message business, and the vast and irresponsible influence of the telegraph managers upon the press of the country. For these and other evils, actual or possible, he sees but one preventive and cure, and that is the purchase of the telegraphic lines by the government under the provisions of the act of 1866, or else the erection of a new system commensurate with the present and prospective needs of the country.

In support of this position, Mr. Creswell presents an imposing array of telegraphic estimates and statistics, domestic and foreign: but lacking a practical acquaintance with the workings of a telegraphic system, his deductions and assertions are for the most part singularly at variance with the legitimate inference to be drawn from the facts he presents.

His tables furnish a perfect arsenal of weapons for his opponents, who have not delayed to turn them with damaging effect upon the measure he proposes. That any considerable extension and cheapening of telegraphic facilities would induce a great many people to use the wires instead of depending on the slower post, no one questions. But it is far from clear that the benefit to the community, educative or otherwise, would be at all commensurate with the cost.

Low tariffs would certainly increase the number of messages; but if the experience of the rest of the world is worth anything, the increase of business would not necessarily make the low rate remunerative. Indeed wherever the experiment has been tried, the adoption of a low tariff has uniformly resulted in a loss. As Sir James Anderson regretfully admits, after an exhaustive study of the subject, "a reduction of tariff leads to a diminution of the net profit, even under the most favorable conditions known." This result, so contrary to experience in every other form of industry, is not difficult to explain. Unlike other kinds of business, the principal cost in telegraphing is labor, the amount of labor, and consequently the expense, increasing in close ratio with any increase in the number of messages. To double the business of any properly regulated office, would require twice as many clerks and operators; and if the line were working anywhere near its full capacity, the increase of business would necessitate a corresponding increase in the number of wires, and the aggregate cost of their maintenance. This fact alone makes it hopeless to expect any such reduction of rates as the advocates of a postal telegraph promise, and a self-supporting system at the same time. The full cost of the transmission of messages must be paid. If the original charge is insufficient, then the deficiency must be made up by the public at large, by taxation in some form or other, as is done in every country where low tariffs have been adopted; and the same argument that would justify a subsidized telegraph as an educator would justify the subsidizing of churches, newspapers, private schools, and a hundred other worthy enterprises which the spirit of our institutions forbids us to make a public charge.

But, it is urged, existing telegraphic rates are nevertheless exorbitant, and ought to be greatly reduced. Of this we lack data for a positive judgment. Still it is clear that the case is not nearly so bad as some have asserted. Mr. Creswell relies largely on the experience of Great Britain in postal telegraphy. There the rate is one shilling. Here the average cost of messages is about fifty cents. There the extreme length of line is six hundred miles. Here it is six thousand. There the country is old, the population is dense, the highways are solid and matured, and the cost of materials and labor much less than here. [In the matter of wire, the American lines pay a duty of sixty per cent.] Here the country is largely new and sparsely settled, the routes are constantly changing, the expense of construction, repair, and maintenance relatively great. As the purchasing power of a shilling in Great Britain is not very much less than that of half a dollar here, it is claimed, with a fair show of reason, that the average American tariff, within a range of 6,000 miles, is not exorbitantly greater than the British tariff within 600 miles. Taking into account the half rate night messages, peculiar to this country, it would seem that the charges of extortion and the like, brought against our American lines, are but feebly sustained by fact.

It may be worth noticing, in this connection, that the English post office carries letters for one penny, delivering them with greater promptness and frequency than has been attempted here, and makes a profit of five million dollars a year. Our postal department carries letters for three cents, without delivery, except in the larger cities, and runs behind something over five millions a year, not counting the interest on the millions invested in post offices and other postal property. The English postal telegraph is a losing business. What might we expect of an American system?

It is urged that, under government control, the telegraphic business of the country would be more economically administered than now, making a corresponding reduction in the rates at least possible. It may be; still, our experience in the matter of canals and other government works does not offer much encouragement to this view, nor does the experience of those governments which have adopted the postal telegraph. The London office, for example, employs more than three times as many clerks and operators as are employed in the Western Union office in this city, to handle about the same number of messages daily. If messages were transmitted with a corresponding greater degree of promptness and precision, the increase of working force might be justified; but they are not. Already the complaint is raised that, while cheapness has been gained by the change from private to public management, the main advantage of a telegraphic message, speed of transmission, is, to a great extent, denied. Red tape has developed itself, as in all other government operations, and frequently a message is delayed for hours, waiting for the proper official to sign it.

As to the doubtful trustiness of private telegraph management, it is enough to observe that the fidelity of the companies to the secrets entrusted to their care certainly compares favorably with that of the post office; and it ill becomes a government responsible for the sins of the custom house and the revenue service to say much about possible breaches of trust on the part of men whose character is yet untarnished.

It is true that the newspapers are largely dependent on the telegraph companies. Would they be less dependent on the government if it should assume control of the wires? Are private companies more likely to tamper with news to suit their own purposes, or have they more purposes to suit than the government? We have the censorship established by France and Russia as a warning; and even without a censorship, the opportunity a government telegraph would have to make itself the only medium of public opinion, by discriminating against obnoxious journals, is not a matter to be lightly considered. Then the risk of government espionage, in private as well as political messages, is at once serious as well as inevitable. Think what mischief could be wrought by a few Jaynes and Sanborns as irresponsible telegraphic managers!

And here we touch the most serious objection of all to the proposed postal telegraph. Private management is pretty sure to put the right men in the right places. The incompetent and trustworthy are weeded out by an inexorable law of natural rejection. Could we expect the same under government management, with our complicated and corrupt civil service? The telegraphic service calls for special training and fitness for the work. So long as partisan zeal and election day services count for more than personal worth or business ability in securing official appointment, there is not much encouragement to expect any remarkable improvement in the *personnel* of the telegraphic system under federal control. Besides, the advantage of an increase of forty or fifty thousand in the army of political appointees, already too numerous, is not strikingly apparent, save perhaps to the party in power.

The Hubbard scheme avoids this difficulty in some degree, yet opens the way to other evils quite as objectionable. The partnership it provides for between the general government and the proposed Postal Telegraph Company is remarkable rather for the skill with which the profits are diverted to the corporation, and the risks and responsibilities to the government, than for any improvement it offers on the existing system. True, it promises a reduction in the tariffs, but any concessions of this sort are more than compensated by privileges and immunities demanded, the burden of which must necessarily fall upon the public at large. In other words, the multitude who rarely need or use the wires must be taxed to cheapen the telegraph for the few whose business or pleasure calls for frequent messages.

A MERITED HONOR TO AN AMERICAN ASTRONOMER.

The highest honor in the gift of the Royal Astronomical Society of England, a gold medal, has recently been awarded to Professor Simon Newcomb, Astronomer in Chief of the United States observatory at Washington, for his tables of Neptune and Uranus, and for other important and valuable contributions to astronomical science. Professors Adams and Cayley, Mr. Glaisher, Sir G. B. Airy, and many other eminent English astronomers were at the session of presentation, which took place at Somerset House, London.

The President of the Society, in his address, reviewed the earlier efforts of Professor Newcomb; and in reference to the above mentioned work remarked that it embodies results only attainable by the exercise of immense labor under the guidance of profound mathematical skill. Its title is "An Investigation of the Orbit of Uranus, with General Tables of its Motion," and it has been under the immediate supervision of the author for some fifteen years.

MACHINES TO MAKE PEOPLE HONEST.

Time was, when almost every stage driver in New York was known to abstract a greater or less share of all fares received, and his employer had no remedy and no sure means of detecting the rogue. But thanks to the ingenuity of the inventor, our Broadway Jehus have been transformed into honest men. They can't steal if they would. The patent money box, in which the passenger drops his fare, relieves the driver from the duty of handling the money, and consequently none sticks to his fingers.

On the street railway cars, the pilfering conductor although not rendered wholly honest, is considerably interfered with and his stealings reduced by means of the patent bell punch. He is required by the rules to punch a strip of paper for every fare received. The punch contains a bell, a dial numbering register, and a receptacle in which the punched bits of paper are received. The punch, paper, and money, are returned to the office by the conductor at the end of every trip. The dial pointer shows how many times the punch has been operated, and the count of holes in the paper, the punched bits within the punch, and also the money, should be all found to agree. Any discrepancy is at once shown. But this device does not fully answer the purpose of detection, because the conductor may take fares and not work the punch, especially in a crowd, without being observed.

The money box plan is apparently the surest. There is a chance for some ingenious person to invent a portable box for conductors, which will be promotive of their integrity in crowded cars.

One of the latest dodges in this line comes to us from Constantinople. The driver or conductor of the car gives to every passenger a prize ticket bearing a number which is recorded on the company's books. A drawing takes place monthly, the company providing a certain number of prizes. We read of one passenger who lately drew a prize of $100 in this way. The hope of drawing a prize makes the passenger careful to send in his tickets; and if the money returns of the driver or conductor are not equal to the number of tickets returned, there is a showing of dishonesty, and the particular culprits may be detected by comparing the return tickets with the records of the tickets issued to the several conductors.

THE PALACE OF MONTEZUMA.

The ancient palace of Montezuma, in the heart of the city of Mexico, where that unfortunate monarch was seized and made captive by the treachery of the Spaniards under Cortez, is described as having been a place of great magnificence. It was full of sculptured arches, pillars, and beautiful fountains. On the consummation of the Spanish conquest, it was converted into the Roman Catholic convent of San Francisco, and became one of the most wealthy and powerful religious institutions of the kind in the New World.

Church and State have, until within the past few years, been always united in Mexico; but a few years ago, under President Juarez, the Congress decreed a separation, and ordered the sale of all church property.

The American Methodists bought the palace last year for mission purposes, for the sum of $16,000, and, on last Christmas day, having cleaned up and repaired the building, it was publicly dedicated to Protestant worship. The walls are five feet thick, and it is built in the most strong and enduring manner. Much of the beautiful original sculpturing still remains, and it could not now be recut, it is said, for less than $100,000. The Methodists have room upon the premises for printing offices, schools, parsonages, etc.; and expect, one of these days, to make it the center of a very extensive scene of educational operations.

THE SUPPLY OF CARBON FOR GUNPOWDER.

It is a very remarkable fact that, with all the discoveries of modern chemistry in the field of explosive compounds, the old-fashioned gunpowder, made of saltpeter, sulphur, and charcoal, has, for the purpose of fire arms, large as well as small, been adhered to and found to be the best, safest, and most reliable of all.

The proportion of these ingredients is of course such that the oxygen required for the combustion of the charcoal is present in the niter, while the sulphur combines with its potassium. Theoretically, gunpowder should therefore consist of one atom each of niter and sulphur, and three atoms of charcoal, corresponding to the formula $KO, NO_5 + S + C_3$. Reducing this to percentage, according to the atomic weights, we have 75 parts niter, 11·77 sulphur, and 13·23 charcoal, which is very nearly the proportion of the best qualities of gunpowder, and is adopted for the Prussian army. Theoretically considered, the combustion changes this formula into $KS + N + C_3 O_6$, or about 40 per cent potassic sulphide, 10 nitrogen, and 50 carbonic acid; but experiments instituted in Austria, by burning gunpowder in small quantities at a time in closed vessels, revealed the fact that the products of combustion are much more complex, producing, besides carbonic acid gas and nitrogen, also carbonic oxide and traces of sulphide of hydrogen, about equal in weight to the solidifiable vapors, which consist of 64 parts per cent sulphate and sulphite of potash, and some 20 per cent carbonate and hydrate of potash; while 10 per cent unburnt carbon and 5 per cent niter were among the solid residue. It has, however, been objected, and not without ground, that the explosive combustion in mass in a gun produces results other than those of the gradual combustion to which the gunpowder was submitted in these experiments.

The strength of gunpowder is augmented by increasing the niter and charcoal, and diminishing the sulphur, of course within certain narrow limits; 76 parts niter, 10 sulphur, and 14 charcoal is the strongest powder, while 77·4 niter, 8·5 saltpeter, and 13·6 charcoal is the quickest; 62 niter, 20 sulphur, and 18 charcoal is slow, and "strains," as the workmen call it; it is capable of raising large masses, and therefore is used for blasting.

The temperature of the ignition of gunpowder is at least 5,000°, and the pressure exerted against the walls of the confining vessels is estimated at about 5,000 atmospheres, or 75,000 lbs. to the square inch.

The quality of the powder depends, of course, on two conditions, the quality of the materials and the manipulation, the latter being the mixing and graining. The object of graining is to afford an instantaneous passage of the flame through all the mass, by the interstices between the grains; and this effect is shown by the fact that meal powder will not explode powerfully. In regard to the materials used, it is easy to obtain sulphur in a condition of sufficient purity, or to purify it when necessary. The saltpeter, also, gives now no difficulty, although in former ages it was sometimes scarce; but since the discovery of the deposits of Chili saltpeter (nitrate of soda), and its easy conversion into common saltpeter, and the deposits of chloride of potassium in Germany, there is no longer any trouble. But with the charcoal, there is always a permanent difficulty. Ure, in his "Dictionary of Arts and Manufactures," says that: "Charcoal is considered by the scientific manufacturers to be the ingredient most influential, by its fluctuating qualities, upon the composition of gunpowder, and therefore it ought always to be prepared under the vigilant and skillful eye of the director of the establishment."

Experience has shown that willow, poplar, and dogwood are the best woods for making charcoal for gunpowder. They are burned in retorts, and care is taken to burn them not entirely black, so that some of the hydrogen remains in the wood. Analysis of the charcoal found by experience to be the best adapted for gunpowder, has shown that it contains a much greater proportion of hydrogen than ordinary charcoal. It is not a little singular that we possess (in Western Virginia) an extensive deposit of a carbonaceous mineral, which has been called grahamite, and has the same composition as gunpowder charcoal. It is, like coal, a result of the carbonization of wood, but differs from coal, asphaltum, albertite, and similar substances in its properties. It swells up when exposed to heat by the evolution of hydrogen gas, and is so exceedingly and powerfully combustible that the air in the mine where it is obtained, when charged with the dry dust of the mineral, has exploded like a mixture of air and coal gas. It has been proposed to use this mineral as a substitute for charcoal for the manufacture of gunpowder, as charcoal is very difficult to obtain in uniform quality, while of this mineral immense deposits are found, of perfect uniformity. Being identical with the gunpowder charcoal in its chemical composition, favorable expectations were entertained, which having been confirmed by some experiments proving it to make a most powerful blasting powder, the principal powder mill in the United States is now engaged in making powder with this material as one of the ingredients.

As gunpowder has been called the great civilizer, and nations which possessed one of its three ingredients have been envied, it is not a little remarkable that the United States should possess an inexhaustible supply of an excellent substitute for the only vegetable ingredient entering into its composition, about which there has always been some uncertainty and trouble.

OUR NAVAL EFFICIENCY.

To any one who has labored under the conviction that our navy, though small, is nevertheless, taking into consideration the class of vessels of which it is composed, of the highest possible efficiency, the reports of the late fleet drill in Florida Bay are especially discouraging.

A larger number of first class ships than ever before has been collected under a single commander are sailed around for several days; and as a result, we are informed that they, practically the cream of the navy, cannot maintain a speed of six knots per hour in company. In other words, if attacked by a squadron of fast foreign iron clads, they could not, if worsted, run away; or if falling in with swift sailing merchantmen, they could not catch them. In letters from officers of high rank, we find it stated, in brief, that our crack wooden ships are practically valueless, that they are loaded down with a mass of rigging which would hamper their efficiency in combat, and that, so far as the experience of the writers extends, the war vessels of the future should be swift steam rams, devoid of sail except such as is a necessity for their safety in stormy weather.

Another fact, equally unpalatable, is that in connection with the torpedo practice. During the course of the drill, the vessels were required to attack a floating target at a speed of four miles per hour and to explode torpedoes from the ends of booms rigged out for the purpose. Some ships fired their charges at the right time and smashed pieces off the target; more did not, and only succeeded in blowing up huge columns of water.

About the only fact evidenced was the absurdity of supposing that an enemy's ship would stand still or slow down to let a vessel stick out a long boom with a lot of rigging and a torpedo on the end, sidle up at the rate of a mile in 15 minutes, poke the torpedo carefully under her water line and fire it, when a single charge of grape at short range would smash boom, rigging, torpedo, and operators into fragments. Our ships were strictly limited to four knots speed, and the operations were supposed to be as closely as possible a reproduction of what would be done in action.

We spent millions, not long ago, for vessels which were to steam 16 knots per hour and carry powerful batteries. Their hulls may now be seen slowly rotting in the navy yards, or else altered into slow cruisers. "Isherwood's costly failures" is their generic name. We are maintaining a torpedo school, sending boards of officers to Europe to report, and trying new inventions of submarine warfare, and yet the first really practical trial of the efficiency of an important branch of the system amounts to nothing, and proves nothing except that an inventor is needed who will devise a new way of adapting the torpedo as an offensive arm to vessels of war.

THE PROPOSED IRRIGATION OF THE COLORADO DESERT.

Senator Jones, of Nevada, proposes soon to bring to the attention of Congress a scheme which, though of colossal magnitude and involving an immense expense, seems nevertheless to find a warranty in the vast benefits which, the projector considers, will be gained by the undertaking. Though great as it is: in these days when we turn continents into islands by canals as large as small rivers, when we burrow under mountains, and contemplate structures reaching almost to the clouds, when we alter river courses, and convert great tracts of swamp into available land: there is really nothing very startling in the suggestion of irrigating a great desert. The objective point of Senator Jones' plan is the vast waste known as the Colorado desert, which stretches from Lower California to Inyo county in the State of California, and from the base of the Coast Range Mountains to the Colorado River, comprising an area about 300 miles long by 150 wide. At their private expense, Senator Jones and a citizen of California recently fitted out a surveying expedition; and from the report of the engineers, it appears that the whole tract may be reclaimed by turning into it the waters of the Colorado River or of the Gulf of California. A large portion of this desert, we learn, consists of fertile soil which is a deep alluvium, susceptible to the highest cultivation. It is also shown that the prevalence of sand storms, hot winds, and deficient rain falls, evils suffered by the adjoining country as far north as the Tulare valley of California, is directly traceable to this arid expanse, from which, as from a great furnace, there constantly rises in summer a vast column of heated air, without appreciable humidity. Thus the moisture of the rain bearing clouds which are blown northwesterly during the summer months from the Gulf of California, is dissipated as soon as they reach the border of this superheated region, and they are prevented from reaching the dry but fertile plains of California beyond.

Mr. R. E. Stretch, an eminent civil engineer of San Francisco, in commenting on the report, points out that shells found on the surface of this desert prove that it has been at one time the bed of a sea, and at a subsequent period the bed of a fresh water lake. The shore lines of both sea and lake can still be seen and recognized in many places; and Mr. Stretch expresses the opinion that the Aztec civilization of the adjacent region in Arizona (of which there are so many traces) came to an end in consequence of the climatic changes caused by the evaporation of these vast lakes in Southern California, after the Colorado River had cut down its bed in the great cañon so deep that its course was diverted at Colville to a southerly direction.

The question is suggested whether these desert lands cannot be reclaimed by irrigation, and thus saved, instead of being totally submerged, as it is considered certain that covering them with vegetation would tend to prevent the evaporation of moisture, and at the same time act as a precipitant for whatever moisture the atmosphere may carry, or whether both plans might not be combined.

THE WHITEHEAD FISH TORPEDO.

For some time past, the European scientific and military journals have devoted considerable attention to the subject of the Whitehead fish torpedo. The secret of this invention, it seems, has been judged as of sufficient importance to warrant the expenditure, by foreign governments, of large sums for its possession. France paid $40,000, Italy, $42,000, and England, $80,000; and so far as the trials instituted by the two former countries extended, the results obtained showed the device as of very high efficiency. The latest experiments conducted at Woolwich, by the English government, have, however, been less successful, and a destructive premature explosion has brought the torpedo both into greater public prominence and also engendered widespread controversy as to its value.

The secret of its construction, although heretofore well guarded, it appears, has leaked out; and from an English military contemporary, we learn that the apparatus consists in a fish-shaped body, twelve feet long by sixteen inches in diameter, with a compartment at each end closed by a bulkhead, and an engine room in the center some eighteen inches in length. The whole is constructed of malleable steel, three sixteenths of an inch thick and hammered upon formers. The motive power is compressed air, which is contained in the rear compartment and thence conducted to a little oscillating engine constructed on the compound principle.

The pressure is regulated by a powerful spring gage, the piston of which, descending, keeps a blast passing into the engine with tolerable evenness at about 600 lbs. to the square inch. The engine actuates a small screw propeller. There is an ingenious automatic steering arrangement, consisting of two balance weights suspended in the center compartment, so that, when the equilibrium of the torpedo is disturbed, these weights touch one side or the other of the shell, striking a lever which communicates with steering fans at the tail end. The fans are behind the propeller and act as rudders, so that, towards whichever side the torpedo heels over, the corresponding fan is set in motion, and corrects its movement by giving a contrary impulse. The explosive material is contained in the forward compartment.

The report of Commodore Kirkland and Master Berwind, of the United States navy, now before us, sets forth the performances of the torpedo during the trials conducted, a couple of months ago, by the Italian government. The main point to be determined was whether the fish would, after being lowered down several feet below the surface of the water in a directing tube, and then started, proceed in a direct line for several hundred feet. The result of the experiments proved that the torpedo would run 600 feet in 33 seconds, that is 10½ knots per hour, under 30 atmospheres pressure, and maintain its direction perfectly at 4 and 5 feet immersion, that it would run 4,500 feet at 7 knots per hour under 37 atmospheres with a slight deviation, that the device could be easily launched and accurately directed from an ordinary boat, and that changes of depth can be effected at the will of the operator, without impairing the qualities of the torpedo in any way. In conclusion, the reporting officers endorse the apparatus in the highest terms.

So far as we are able to judge from the account of the official investigation of the Woolwich explosion, the disaster was the result of inevitable accident, and does not militate against the invention to any grave extent, at least not to the degree which the *Army and Navy Journal*, in discussing the subject, presupposes; 379 runs of this description of torpedo had previously been without accident, and the apparatus which blew up had already been tried nine times. Its metal had been previously tested to 1,200 lbs.; and after the disaster, a fragment was subjected to a strain of 100,000 lbs., without flaw. It burst at 800 lbs. and while in a perfectly quiet state, the operators being engaged in oiling the bearings previous to starting. Dismissing this defect, therefore, as one due to faulty construction in but a single instance, it would appear that the Whitehead torpedo is thus far the most successful of any of the self-governing submarine offensive arms. The circumstances of the Italian tests were calculated to try the advantages of the invention severely, and that it went through them successfully is strong evidence of its efficiency.

[*Continued from first page.*]

liquor casks, or other tight work. It is easily adjustable, and hence is well suited for acting on barrels of different sizes, and will, we were informed, truss with perfect evenness from three to five hundred oil, or from ten to fifteen hundred sugar or flour, barrels in a day. The manufacturers claim that it will do the work of twenty men, and require little or no repairs.

The barrel which we had followed through its various manipulations, now being leveled and trussed, was next passed to a machine which is unquestionably an invention of extraordinary merit and ingenuity. Our artist has represented it in Fig. 1 as it appears in operation, the moment selected being that just after a finished barrel leaves and a rough one enters. If the reader will notice the three casks on the skids in the foreground, he will observe that the edges are irregular, due to the varying length, etc., of the staves. Now, before the heads are put in, each cask at each end must be crozed and chamfered: that is, a groove must be cut around the inside, a short distance below the edge, while the latter must be beveled off. Besides, the ends of all the staves must be cut off perfectly true. Every one at all conversant with coopering understands that this work, when done by hand, is the most difficult and requires more time than any labor about the barrel; and this is even augmented when, in heavy casks, it is also necessary to cut a howel, or wide semicircular indentation around just below the croze.

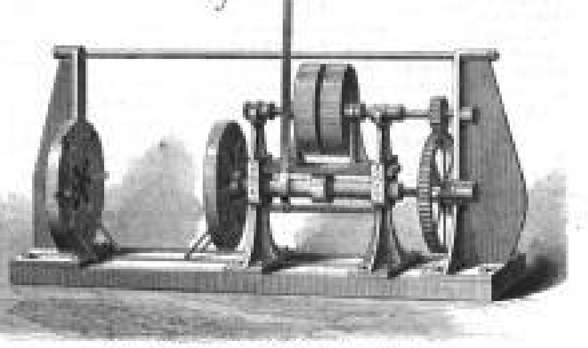


Fig. 3

BARREL MAKING.—THE LEVELING MACHINE.

Some idea of the efficacy of the machine shown in Fig. 1 will therefore be formed when we state that it chamfers, howels, levels, and crozes a cask of imperfect periphery with the same exactness as if it were a perfect circle, finishes both ends at once, and runs off from 800 to 1,200 barrels per day with ease.

The barrel passes from the skids directly between the chuck rings, and its ends fit into the peripheries of the cog wheels which work within the former. The workman, in our engraving, is shown turning the wheel, which, through suitable gearing, governs the backward and forward motion of the right hand ring. The other chuck ring is stationary. As the barrel rolls into place the workman brings his ring up, thus confining it; then, by a pull of a lever, he throws a clutch into gear, which results in the rapid rotation of the barrel. Finally, by manipulating a third lever, he brings the cutters—which perform the above mentioned operations, and which are all fastened on two circular heads, the shafts of which are mounted on vibrating carriages and revolved by the two smaller belts represented—up against the inner edge of the barrel. One revolution of the latter and the work is done. The ring is drawn back and the cask rolled out, with the work of hours (by hand) finished in a few seconds. Each cutter head is controlled by a rest upon the outside, thus compelling a uniform thickness and depth of chime, while the same is leveled in a perfect manner. By proper sized chuck rings, any kind of barrel may be operated upon, and the change from one size of ring to another is very easily effected.

From this point, we were told, the rest of the work upon the barrel is best done by hand. We saw the casks, as they left the machine just described, pass to an elevator, and thence to an upper loft, where an army of men were busily putting on the hoops, setting the heads in place, and otherwise completing the labor. Barrels differ so much in shape that it would be hardly practicable, it is said, to substitute machinery in this department; but to the casual observer it does not seem impossible, in view of so many ingenious devices having already been invented for work which, not long since, it was thought impracticable to accomplish save by hand. A glance into a great store room, revealing tier after tier of barrels (twenty-five thousand in all, we were told), completed our stay in this portion of the factory; and descending to a lower floor, we were shown the device which forms the subject of our fourth figure. It is a combined fan and stave jointer, that is, it holds the staves firmly and cuts the joints on their edges, leaving each piece in the proper form to take its place in making up the barrel. It was used in the establishment which we visited to rejoint staves which had their edges split, or which otherwise were imperfect. Its principal advantage is that, in addition to occupying but little room, it gives off no dust or shavings to create nuisances in journals and boxes, or to afford ready tinder for the reception of stray sparks. All the *débris* is blown through suitable conductors to the fuel room. The apparatus works with great ease. When a stave is to be clamped, the stave holder is brought to bear upon it, and it is brought in contact with the jointer by the foot of the operator. As soon as the foot is removed, the clamp, by self action, releases the stave, and is ready for another. A stave, it appears, cannot become loose or move until the clamp recedes from the cutters.

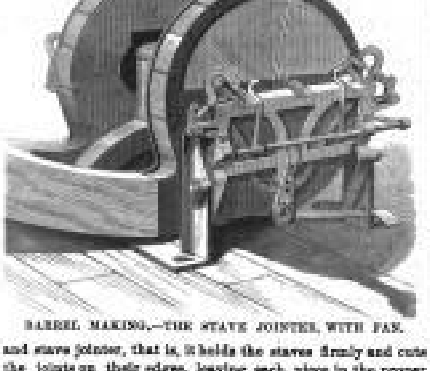


Fig. 4

BARREL MAKING.—THE STAVE JOINTER, WITH FAN.

Lack of space prevents our entering more in detail into these machines, or entering into explanation of other barrel making devices constructed by the manufacturers; suffice it to say that illustrations and descriptions will probably follow in these columns, of a variety of other machines for like purposes, made by the same firm, Messrs. E. & B. Holmes, of 59 Chicago street, Buffalo, N. Y. Parties desiring further information may address as above.

Cure of Rheumatism in a Horse by Electricity.

G. D. Powell, M.D., in the *Irish Farmers' Gazette*, describes the cure of a valuable horse by means of electro-puncture needles, from four to six being inserted in the principal muscles of the fore quarters, also along the spine and hind quarters. The battery employed was that of Leclanché, from four to twelve large cells, alternating in strength, and the current broken, causing the muscles to contract perceptibly. This was kept up from two to three minutes at each place. Prior to treatment, the animal was in so bad a condition that the owner was about to cause him to be shot. But within about six weeks after the commencement of the electrical treatment, the horse was perfectly restored, and is now sound and useful.

IMPROVED SPIKE BAR.

Railroad employees are well aware that bars for drawing spikes on tracks are very liable to become broken. The point at which they usually fail is at the claws; and necessarily if one of the latter is destroyed, the bar is rendered useless until it can be repaired. This occasions much inconvenience and delay, but a remedy for the trouble is now offered in the invention herewith illustrated in perspective, Fig. 1, and section, Fig. 2, which consists in making the claws in separate pieces, and attaching them to the bar so that, if either claw fails, it can be removed and another quickly substituted.

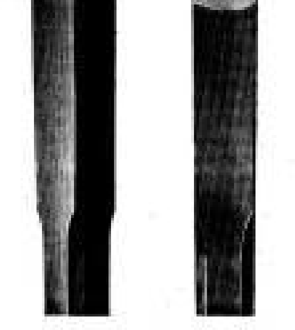


Fig. 1 Fig. 2

The lever is formed with a square or angular socket, A, in its enlarged end, and the claws, B, are made with shanks which fit into and fill the space. Shoulders, B, are made upon each claw to rest against the end of the lever. C is a pin which passes through a hole which is bored through the socket and through the jaws so as to cut a half circle from each shank. The pin is made somewhat tapering so as to be readily withdrawn.

The claws may be made in pairs to fit spikes of different sizes or to adapt the bar to other purposes, as may be desired. The pin, C, holds them in place and may be easily removed when it is desired to change them.

Patented through the Scientific American Patent Agency, October 28, 1873. For further information address the inventor, Mr. George Douglass, 19 Water street, Bridgeport, Conn.

Peat Coal.

Kidd's process for carbonizing peat consists of a large chamber or drying room connected with a boiler which supplies superheated steam; from the boiler a steam pipe passes through the furnace, and from thence into the flue: the steam, in its passage over the boiler fire, becomes superheated, and, together with the smoke, passes into the drying chamber; the peat, cut into pieces about the size of bricks, is put into a framework which runs upon wheels, so that it easily runs into the drying chamber, and is run out again when finished, thus saving a great deal of labor. The object of Kidd's process is the collection of the heated gases of the furnace in a closed chamber, where they may be usefully employed in charring peat, or converting it into charcoal; artificial draft is created by jets of superheated steam, and the whole products of combustion from the furnace are forced into and retained by the closed chamber. The chamber is filled with peat, which may be dried and charred in less than forty-eight hours by the action of the furnace gases and superheated steam; the temperature of the chamber soon rises to between 300° and 400° Fah., and remains at some temperature between those limits. By charring the peat at a low temperature the loss of hydrocarbons is very small, the gases which are poured into the chamber being for the most part non-supporters of combustion; consequently it is impossible for the peat to take fire during the process of charring. The fuel used in the furnace which supplies the gases and generates the steam is peat, which has been partially dried in the open air. It is estimated that a ton of peat charcoal can be produced by this method at a cost of $2.35, which sum includes all charges for interest on capital, royalties, and labor, raw peat at 72 cents a ton that used for fuel, $1.8 per ton. Peat thus prepared produced a gas of high illuminating power, ranging between 20 and 22 candles and 8,000 and 9,000 feet per ton; the gas is generated so quickly that three charges of peat can be worked off to one of coal, thus effecting considerable economy in the plant of gas works. The charcoal which remains after the gas has been extracted is also much more valuable than the ordinary coal gas coke. There is, no doubt, a large field open for commercial enterprise in the manufacture of peat charcoal, owing to its freedom from sulphur and its affinity for oxygen at a high temperature. It is equal to ordinary charcoal for refining iron, steel, and other metals, as a fertilizer, and for filtering water and town sewage.—*Chemical News.*

TOSELLI'S SOUNDING APPARATUS.

The *Revue Industrielle* reports the invention of the novel sounding device, represented in our engravings, by M. Toselli, an Italian engineer officer. It is composed of two arms, A B, which are pivoted in the support, C, and which carry on their extremities cups, E F. The head, F, is fixed to a rod, D, which has a T shaped head, which, as represented in Fig. 1, drops down over the upper and curved ends of the arms and holds them open. In using the device, it is lowered until the weight strikes the bottom, when the T head is caused to lift and free the arms, which fall by their own gravity. The depth of water is noted in the usual way, from the lead line; hence the particular advantage of this invention is that it brings up with it specimens of the bottom inclosed between the two cups, which meet as shown in Fig. 2. The T head on the weight rod, it will be noticed from the last mentioned engraving, drops, when the arms are closed, into notches on the upper end of the latter, thus securely preventing their opening.

Fig. 2.

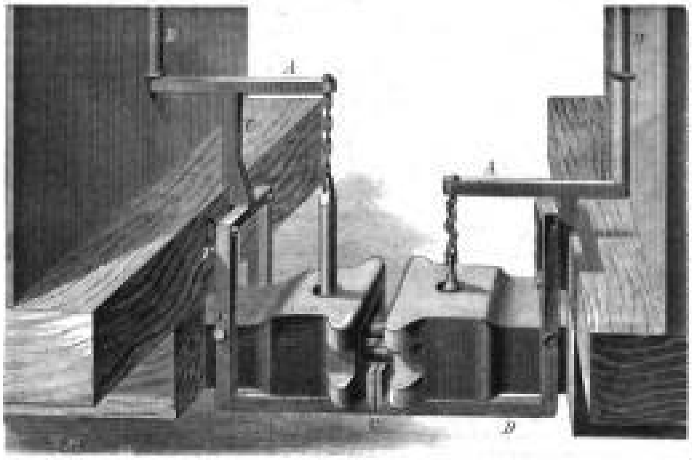
STILES' IMPROVED CAR COUPLING.

The invention herewith illustrated is designed to couple cars together automatically, and to afford simple means whereby the mechanism may be readily adjusted for operation. The necessity which exists for improved apparatus of this description, and the general advantages to be gained by an efficient self-acting device, have already been fully detailed in these columns, so that no reiteration of the facts is here deemed necessary.

The present invention consists in an arm, A, connecting with a vertical rod, B, which leads upward through guides in the end of the car, and with a bar, C, which enters a groove in the block above the drawhead. The lower end of this bar is widened and inclined at its front portion, so as to force the upper end of the elbow frame, D, forward, and rise above it when the coupling pin, which is suspended from the arm, A, is to be pulled out. The lower extremity of the bar, C, then rests upon the elbow frame, as shown on the left of our engraving. This frame is pivoted to the drawhead at E, and is provided with springs at F, which pull its top back under the bar, C, as soon as the latter has been raised high enough to lift the pin out of the link and hold the same ready to let it fall when required. Below the drawhead, the frame, D, supports a plate, G, which rises a little above the bottom wall of the opening for the link, so as to hold the outer end of the latter up to enter the drawhead of the other car.

When the two plates, G, of the cars meet, the upper ends of frames, D, are thrown forward out from under bars, C. They therefore fall, and the pins, descending, slip [through the link. It is proposed to have the rods, B, extend to the tops of freight cars, so that the brakeman on the roof can easily lift the pin and adjust the coupling.

Patented through the Scientific American Patent Agency, February 10, 1874. For further information address Messrs. Stiles & Carlow, Bloomfield, Davis county, Iowa.



STILES' IMPROVED CAR COUPLING.

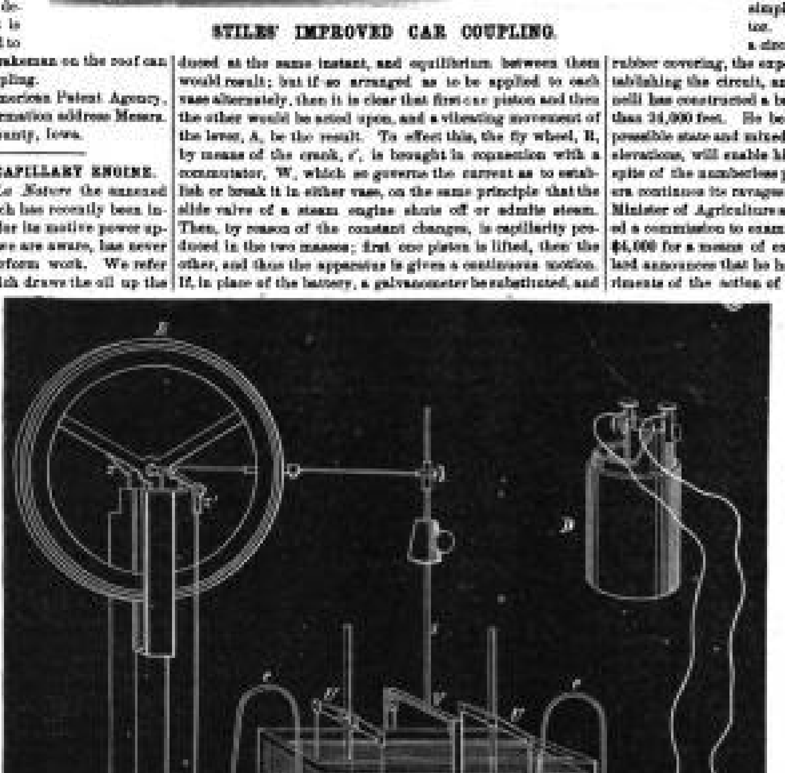
A NEW MOTOR—THE ELECTRO-CAPILLARY ENGINE.

We extract from the pages of *La Nature* the annexed engraving of a curious machine which has recently been invented in France, and which relies for its motive power upon a natural force which, so far as we are aware, has never before been directly utilized to perform work. We refer to capillary attraction—the force which draws the oil up the wick of a lamp, to cite a homely and familiar example—and to the phenomena of which physicists have devoted no small amount of profound study. Although the laws governing this branch of science have been discovered and mathematical formulæ deduced in accordance with their workings, it has remained to devise a means to harness the force and compel it to drive mechanism. This means, the inventor of the present apparatus believes, is electricity.

There is a simple experiment which any one of our readers can perform for himself, and which will at once render clear the operation of the motor we are about to describe. Place a drop of mercury in the bottom of a glass and fill the latter with water slightly acidulated with sulphuric acid and also treated with a few drops of bichromate of potash. If now the mercury be touched with an iron point, it will be observed to contract quickly, and to take a a new form, which it will maintain until the point be withdrawn, when it will resume its former shape. These alternate contractions and expansions, it will be found, can be made to succeed each other as rapidly as the point can be applied and removed; and when a large drop of mercury is used, they become so odd as to be quite amusing. It is the galvanic current which is produced by the iron, the acidulated water, and the mercury, which changes the force of the capillary attraction, for it is this power which, in the beginning, keeps the drop of quicksilver in its globular form and prevents it spreading or flattening out.

In our illustration, K is a glass vat filled with diluted sulphuric acid, in which are placed two smaller vessels, G, in which the mercury is placed. In each vase is plunged a bundle of glass tubes, B, all arranged vertically and open at both ends. Each bundle floats on the mercury and is connected with a rod which carries a horizontal crosshead, U, from which extend downward other rods, which are attached to the extremities of the pivoted lever, A. The bundles of tubes, B, correspond to pistons, and, by alternately moving up and down in their chambers, impart an oscillating motion to the lever, A, this to the frame, V, rod, S, crank, Z, and, finally, belt or fly wheel, R. The mechanism thus far clear, we pass to the mode of developing the power, and this a single element, D, of a Daniell battery. By means of the bent iron wires, *c*, the current is brought in communication with the mercury. If carried to both vessels together, it is evident that the change in both would be produced at the same instant, and equilibrium between them would result; but if so arranged as to be applied to each vase alternately, then it is clear that first one piston and then the other would be acted upon, and a vibrating movement of the lever, A, be the result. To effect this, the fly wheel, R, by means of the crank, *c'*, is brought in connection with a commutator, W, which so governs the current as to establish or break it in either vase, on the same principle that the slide valve of a steam engine shuts off or admits steam. Then, by reason of the constant changes, is capillarity produced in the two masses; first one piston is lifted, then the other, and thus the apparatus is given a continuous motion. If, in place of the battery, a galvanometer be substituted, and the wheel, R, turned by hand, the needle will at once indicate the existence of a current.

It is of course hardly probable that any amount of useful power can be gained from this machine, but it is nevertheless a very ingenious device, and one which, perhaps, may prove a valuable suggestion for other applications of the same force.



THE ELECTRO-CAPILLARY ENGINE.

SCIENTIFIC NOTES FROM THE FRENCH ACADEMY OF SCIENCES.

From the reports of recent sessions of the French Academy of Sciences, we glean the following interesting morsels of scientific intelligence.

France, it seems, has experienced a unusually mild winter. M. Tastes has investigated the matter and thinks that he has found a great atmospheric current crossing the country, which bears about the same relation to the atmosphere as the Gulf Stream does to the ocean. This current becomes displaced in longitude; and according as a given region is in the center or on the borders of the aerial flood, the winter is calm and mild or else visited with cold and storms.

Good results are communicated to the Academy from experiments in using [illegible] tannate of protoxide of iron as a preservative of wood. The tissue on injection becomes thoroughly impregnated with a veritable ink, which prevents the destroying action of the weather. M. Monier sends some curious specimens which, though seeming to be very hard graphite, capable of scratching glass and even steel, are composed of sugar—the residuum after evaporating, probably—heated, away from the air, to a white red temperature. MM. Joly and Barbier suggest that the wires used for electric bells and similar purposes in buildings may be converted into fire detectors if they are simply coated with rubber as an insulator. The idea is that, where the wires of a circuit touch, on the heat melting the rubber covering, the exposed copper will come in contact, establishing the circuit, and so sounding the alarms. M. Spinelli has constructed a balloon and proposes to ascend higher than 34,000 feet. He believes that pure oxygen, in a compressible state and mixed with the rare atmosphere at great elevations, will enable him to breathe without difficulty. In spite of the numberless preventives suggested, the phylloxera continues its ravages in the vineyards of France. The Minister of Agriculture and Commerce has recently appointed a commission to examine plans, and has offered a prize of $4,000 for a means of exterminating the nuisance. M. Ballard announces that he has completed a long series of experiments of the action of water on lead, and concludes that water containing sulphates and carbonates, attacks the metal very slightly, while the effect of water charged with chlorides and nitrates is very plainly marked.

M. Cailletet has been investigating the question of the variation in volume, of a hollow glass cylinder when compressed from without or within. A tube of glass, 39 inches long and 4 inches in diameter, was broken under an exterior pressure of 77 atmospheres, half of which force, exerted from within, sufficed to rupture it. In using very thick tubes, equal to the resistance of 400 or 500 atmospheres, there is no permanent distortion of the glass.

M. Vigleau notes the discovery of some curious crystals of glass extracted from a furnace which had been cold for some time. They differ completely in aspect and form from devitrified glass, appearing in the form of isolated prisms, each some 0·03 inch in length. This composition is different from that of the normal glass of the furnace, as soda is absent, while magnesia is present in excess.

Simple Timber Preservative.

To render posts or timber, placed in the ground, practically impervious to moisture, and for a long time prevent decay, the following simple recipe has been tried and found to answer the purpose excellently. For fence and gate posts, it is particularly recommended:

Take linseed oil, boil it, and mix it with charcoal dust until the mixture has the consistence of an ordinary paint. Give to the posts a single coat of the mixture or paint before planting them, and no farmer, says one who has used it, living to the age of the patriarchs of old will live long enough to see the same posts rotten.

The posts or timber should be well seasoned and dry when the paint is applied.

Correspondence.

Ramming the Mold.

To the Editor of the Scientific American:

Having had considerable experience in the molding branch of the foundery business, I will endeavor to give your readers some information which will, if proper attention is paid to it, remove a great many of the annoyances that molders have to contend with.

As there is an endless variety of patterns from which the molds are made, it will be necessary to divide them into light and heavy work. Stove castings, as we all know, are very light. In the molding of such work, much depends upon the quality of sand used; the molder's heap should be composed of no more than one half loam, the other half being a very open sand. This makes a good strong mixture, which will not allow the sharp corners and fine ornamental work to be washed away when the molten iron is poured into the mold. In ramming such work, the molder should be careful that the sand on top and bottom of his pattern is not rammed hard; but the sides or edges should be well rammed, in order that the casting may not strain from having a soft parting. Great care should be taken to seeing that the bottom board is well bedded on the flask, after which it should be removed and the vent wire used freely. The venting of the work is often but partially done, on account of the point of the vent wire coming into contact with the pattern; and when the iron enters the mold, it finds its way into said vents, fills them up, and thus, in a measure, prevents the escape of the gas that arises from the iron coming in contact with the charcoal, black lead, or soapstone, with which the mold has been dusted to prevent the sand from adhering to the casting. The bottom board should then be carefully replaced on the flask, and dogged down so that, in the act of turning it over, it could not move, which would cover the vents over with sand. The top part of the flask (or cope, as it is termed by tradesmen) needs the same care in ramming over the pattern as the bottom, and should be well vented. If the mold has any high projections in the cope, they should be well vented: for it is at these elevated points that a large portion of the gas accumulates and needs a quick exit, in order to make sharp corners on the casting and prevent blowing. The strainings of castings in this branch of the trade is greatly due to an insufficient amount of weight being placed on the flask, or the parts not being properly dogged together, as well as to the rapidity with which the iron is poured into the mold, together with the hight of the runner. Cutting short the supply of iron as soon as the runner is full, and a careful watching of the work to be poured, will, in most cases, remedy the trouble of the casting being thicker than the pattern.

As to the warping of the plates, much depends upon the quality of iron used and the judgment of the pattern maker. It can often be prevented in a measure by the molder, in making the runner from the round sprue no thicker than the the piece to be cast; and, as soon as the metal is poured, by digging away in front of the sprue and breaking it loose from the casting. Where a flat sprue is used, this breaking off should invariably be done as soon as the runner is cool enough. It being wedge-shaped, with the small end of the wedge downwards, it lifts a portion of the casting in shrinking, and thus causes it to be out of shape.

In heavy work, care and judgment is needed, and it requires a man's lifetime to become proficient in. In ramming work that is to be poured on its end, having a hight of three or four feet, there is no risk in well ramming the sand, for two thirds its hight, around the pattern; and as you near the top, ram it as you would a pattern no more than a foot in thickness. The sand in all such work should be very open or porous, in order to prevent scabbing. As there is so large a quantity of iron used, much steam and gas is generated in the mold; and as there is no other way of escape for them but through the vents, there should be no fault in this particular part of the mold. In the pouring of such work, it is best to run it from the bottom. If a runner is used, do not raise the risers to correspond in hight with the runner, as, by so doing, you increase the amount of strain on the mold; but form a little basin around the risers by ramming out the sprue holes with the finger; and on the side nearest the outer edge of the flask, form a lip for the surplus iron in the runner to run over on to the floor. When heavy work is bedded in the floor too much care cannot be taken in preventing the dampness of the ground beneath from striking through into the mold. The sand that is thrown out of the pit, if it has been of long standing, should not be used for the molding of that piece; for it is too cold and damp, and should be thrown on one side, and allowed to stand that it may dry and warm up. The two or three ladlefuls of iron, that remain in the furnace after the work on the floor has been poured, can be run into pigs in this sand, which will greatly help to fit it for immediate use. In the venting of heavy work, the small vents should terminate in a number of large ones, which should have an opening on both sides of the mold; then a draft would be formed to carry off the gas which is continually forming as the workman is in the act of pouring the iron into the mold.

All men connected with this branch of the trade have heard that sharp report which immediately follows the pouring of a large piece, the same being caused by the confined gas in the lower end of a large vent, there being no draft to drive it out. Where facing is used, much more care is needed in venting. In the making of large pulleys and gear wheels, too much care cannot be taken in this particular. I hold that not so much depends upon the ramming of such work as upon the venting for the proper exit of the gas from the sand in the immediate vicinity of the mold; for if the mold has been rammed harder than there was any necessity for, and the venting has been properly looked after, there is not much danger of the casting being a poor one. Such work should invariably be run from the hub or center, with sufficient risers, arranged as above described. This branch of the trade is called green sand work, and it involves a large part of the art of ramming.

Newburgh, N. Y. LEANDER CLARK, JR.

A New Beech Blight.

To the Editor of the Scientific American:

My attention was arrested by the article on page 371, of the *Science Record* (Munn & Co.) for 1874, stating that J. König observes that: "In Westphalia the beech trees have been recently attacked by a new form of blight, which, commencing on the bark, finally covers the tree with a snow-white down, producing sickness and sometimes death. The microscope shows this blight to consist of fine threads, among which occurs a small insect, apparently an undescribed species. These threads, which are secreted by the insect, consist of wax which has a melting point of 78° or 80°, and the percentage composition of which is: Carbon 81·39, hydrogen 13·58, oxygen 5·03. Both composition and melting point are very near those of Chinese wax," etc. The foregoing is literally a copy.

In the summer of 1857, I noticed a fine beech tree in a valley, which at first sight seemed covered, especially on the lower branches, with snow flakes, so dense and white did they appear; this novel sight, to one well acquainted with the beech tree (*fagus ferruginea, Ait.*) arrested my especial attention. Supposing it to be occasioned by some minute fungus, I cut off a lower branch for a closer inspection, when I noticed that the white incrustation was produced by a dense aggregation of cottony pellets, which had a kind of oscillating motion. On removing some, I discovered minute insects, similar to the well known plant lice (family *aphidæ*), etc. It would seem that this blight is not so very new after all. Westwood figures the larva of the *psylla betulæ*, as also a winged specimen of the largest British species of *psylla*.

It is not my object, however, to enter upon a lengthy notice of a family comprised of very numerous and obnoxious species; but simply to put on record my own observations with regard to what I believe to be a native species, seeing that I met with them remote from introduced plants of any kind; no farm was within 2½ miles of the locality.

I would simply add that neither from Mr. Reilly, Mr. Walsh, or Mr. Harris could I learn anything further about this species, or if it were ever before noticed; nor would I have again thought of it but for the article in the *Science Record*, in which no description is given.

I hope to draw out more information on this subject, interesting to entomologists generally as well as those who cultivate the beech. JACOB STAUFFER.

Lancaster, Pa.

Completion of the New Iron Bridge over the Saco River, Me.

To the Editor of the Scientific American:

Yesterday we received a telegram that the last span of the iron bridge over the Saco river, at Biddeford, Me., had been swung. As this has been a rapid piece of work, and well illustrates the advantages of the American system of building iron bridges—that of interchangeable parts and pin connections, as contrasted with the system of connection by rivets—we give you a brief description.

On January 20, the wooden bridge, 600 feet long, was burned down. On the 24th, the Eastern Railway contracted with the Phoenixville Bridge Company for 3 spans of 133 feet each and 2 spans of 100 feet each, to supply its place. At that time the iron lay in puddle bar. The drawings were made, the iron rolled, finished into shape, and shipped by steamer and rail to Saco, and the spans erected, ready for use, in forty days. The cost of the bridge is a little under forty thousand dollars. CLARKE, REEVES & CO.

Phoenixville Bridge Works, Philadelphia, Pa.

Accidents by Car Coupling and Switches.

To the Editor of the Scientific American:

Your assertion, in a late number, that 400 men were killed on the Pennsylvania Central Railroad alone, in 11 months of 1873, is no doubt true. In our village alone, a man a month is slaughtered, besides numerous losses of hands and feet. The men who pursue this terrible calling are all in the prime of life and fullness of manhood. They go forth each day, knowing what their ultimate fate is to be, a terrible death, mangled almost out of semblance to humanity. Yet each one that is thus killed has a dozen ready to step into his bloody shoes. Can nothing be done to avert this slaughter? Have the hundreds of self-couplers ever had a chance for trial on any railroad? Not that I ever heard of. Yet surely some of them must have merits.

It is generally asserted that most of these men are killed by catching their feet in the frog. This is in no case true. The feet are caught at each end of the "guard rail," on each side of the frog, where the rail curves out, so the car wheels will not strike it. If a wooden block were placed in each end of this guard rail, large enough to keep the feet from being caught, yet so that the wheels would pass between it and the rail, these slaughters would be comparatively unknown.

Burlington, Iowa. EXPERT.

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THE American sleeping and hotel cars are now coming into use in England. A late number of *Engineering* speaks very flatteringly of a recent trial of Pullman cars on the Midland Railway.

[For the Scientific American.]

Why do Grindstones Burst?

In olden times, grindstones were always made with a square hole in the center, about six inches across, in which a square iron shaft was placed and the stone adjusted by means of wooden wedges, driven around the shaft with sufficient force to hold the stone securely in its place, and to resist the power applied to the shaft when dressing the stone off. This resistance at the edge, being equal to a lever purchase of half the diameter of the stone, has a tendency to burst the stone by the pressure, of the shaft in the eye of the stone, which is also frequently augmented by the swelling of the wood employed as wedges.

Bursting of grindstones was a common occurrence under these circumstances, happening sometimes soon after the stone was hung, but frequently after being weakened by wearing away a part of it. Grindstones are generally hung at nail works by means of two heavy cast iron plates with square holes and a heavy square boss cast on the outside. Four holes are bored through the stone near the corners of the eye, corresponding with the four similar holes in the plates, through which four bolts pass and fasten the plates securely to the sides of the stone by means of nuts. A square shaft passes through the center of the plates, and the stone is adjusted by means of eight set screws passing through the boss, and resting against the sides of the square shaft. This relieves the eye of the stone from any strain, but the tendency of the four holes in lines with the corners of the eye is to weaken the stone in those directions. A case occurred of grindstones having been burst by using cast iron plates with a square boss 4 inches long, cast on the inside of the plates and tapering towards the end, which was fitted snug into the eye of the stone; and the plates being pressed against its sides, the tapering boss acted as a wedge, and two stones were burst in this way before the cause was discovered. The best mode of hanging a grindstone is on a round shaft of wrought iron on which a collar is forged, with two cast iron plates of about one third the diameter of the stone in size and dished so as to bear on the outside edge only. A screw is cut on the shaft and fitted with a heavy nut, by means of which the two plates are pressed against the sides of the stones, holding it firmly by pressure and friction alone and relieving the eye from all strain. A stone hung in this manner should not burst except by centrifugal force, caused by the stone being run at a very high rate of speed; but stones do burst even when hung so, and when not running at a dangerous rate of speed. As the bursting of a grindstone is always fraught with great danger to the workmen using it, and in its vicinity, it becomes of considerable interest to know the cause. Grindstones vary very much in the composition and in the manner in which their particles are held together. Some stones are composed of grains of pure sand, which have been pressed together with little or no cementing material, leaving numerous interstices among their particles. In others the particles of sand are cemented together with clay, rendering the stone much more compact and strong. A stone of the first kind, being porous, will weigh less to the cubic foot than the latter and will absorb more water when in use, thereby rendering it still less strong. The quantity of water absorbed by a stone of this character has been proved by actual experiment to be equal to 12 lbs. to the cubic foot, while in the closer and more compact stones it is but 5½ lbs.; so that, if a dry porous stone of 6 feet diameter by 12 inches thick contain 27 cubic feet, it will absorb 324 lbs. of water when in use; and when such a stone is allowed to stand over night a considerable portion of the water will settle in the lower half of the stone, while the upper, being exposed to a free circulation of air, will lose its water by evaporation and be left comparatively dry; so that, no matter how true the stone may be dressed, the effect when in motion will be the same as of a badly balanced fly wheel; and with a little increase over the usual speed, the tendency will be, of the wet side, to fly off from the rest of the stone, or in other words to burst the stone. A case of this kind recently occurred in New Jersey. A workman had been using a stone of this character for grinding sad irons. The stone being completely saturated with water over night, the following morning he started the stone (which was about 4 feet diameter by 1 foot thick); and after working a short time, had occasion to step aside for a few moments, when the stone burst, a quarter of it passing through the roof and lodging in the side of an adjoining building. Another struck a heavy driving shaft in front of the stone, and a third fell in the pit in which the stone was running. The usual speed of this stone was about 180 turns a minute, which it is supposed was somewhat increased by the absence of the grinder. The increase of the speed of an unequally balanced stone of a porous character caused it to burst. Great care should be exercised in examining a stone for defects before hanging it. This can best be done by washing off the sides and edge with water and a broom; and if any crack be discovered, the stone should be rejected. No part of a grindstone should be allowed to stand in water when not in use, as this would but increase the tendency to burst in the manner above referred to, besides causing a soft place. J. E. M.

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SLUGS AND SNAILS.—A correspondent of the London *Field* suggests an easy and, he says, most effectual way of getting rid of these garden pests, namely: Put small heaps of bran (about two handfuls) close to the plants which they destroy most, and then, about 10 or 11 o'clock at night, go round and put a handful of quicklime on each heap; the number of slugs found killed in the morning will be almost incredible. Slugs prefer bran to any fruit or vegetable, and will congregate on these heaps from all parts of the garden.

SCIENTIFIC AND PRACTICAL INFORMATION.

A NEW SACCHAROMETER AND A MONOCHROMATIC SODIUM FLAME.

The new instrument invented by M. Laurent, of Paris, is composed of an ordinary bi-refracting prism for a polarizer and a Nicol for an analyzer. The latter is fixed, with a small Galilean telescope, on an alidade with which it turns. The novel portion consists in a thin plate of cloven gypsum, covering the half of a diaphragm, situated between the polarizer and analyzer. Placed between two Nicols, of which the principal sections are perpendicular, this plate gives yellow of the second order, corresponding to the D sodium line, either with white or with yellow light. If the Nicols have their sections parallel, with white light, the complementary color, a blue violet, is obtained: with yellow light, black. The plate of gypsum produces therefore in very simple manner the effect of a polarizer in two portions, of which the principal sections make to each other a certain angle; and moreover it permits, without complication, the rendering of this angle variable between 0° and 45°, a point of considerable advantage in practice; for on a liquid more or less discolored being given, the angle which will give the maximum of precision may be chosen.

In order to render the sodium flame quite monochromatic, it suffices to interpose between the flame and the polarizer a plate of bichromate of potash, a substance which has the property of absorbing the violet, blue, and a part of the green rays present in the sodium light, which diminish precision when it is desired to establish the equality of shades in giving different colors to the two portions of the diaphragm.

COMPARATIVE VALUE OF ARTIFICIAL ALIZARINE AND MADDER.

The Industrial Society of Mulhouse, France, have recently published a report on the effect of the introduction of artificial alizarine upon the consumption of madder. The employment of the former product is constantly augmenting, and it is manufactured on a large scale in Alsace, Germany, and Russia. It is believed, however, that the large demand will not affect the normal consumption of madder; or in other words, the proportion of pure madder used in the arts, before the introduction into commerce of extracts of madder, will remain unchanged. It is with these extracts that artificial alizarine comes in competition, but only to a certain extent; for while it produces violet shades of greater brilliancy and beauty, its red are inferior. In order to completely replace madder, another principle of that material must be present in the artificial product, namely purpurine, which furnishes fine orange reds, but of which at the present time even the chemical constitution is not definitely known. Hence it is considered that the best tints can be obtained by artificial alizarine and madder extract combined, employing the latter of the shade of red most closely approximating orange.

THE WILD PLANTAIN AS PAPER STOCK.

The Belgian Consul General in British India reports that the fiber of the wild plantain, found in great quantities in the Andaman Islands, has been successfully used in paper making. The directors of the Bally paper mills, in the above mentioned country, state that the material is worth $40 a ton, and that they are purchasing it in quantities at that price.

DETECTION OF ACETIC ACID IN WINES.

M. Kissel says that, in separating acetic acid from wines by distillation, the acid may escape undetected, because it forms acetic ether with the alcohol. This inconvenience may be avoided by saturating the wine with baryta. The alcohol is then distilled off, and phosphoric acid added to the residue. On distilling again, the acetic acid is found in the distillate, and may be determined.

FRACTURE OF A FLY WHEEL.

At the Chatham Dockyard recently, the great fly wheel of the rolling mills steam engine, weighing nearly thirty-five tuns, broke to pieces while revolving at great speed, and the fragments were violently hurled in all directions. No one was hurt. The second motion cog wheel, weighing several tuns, was broken by pieces of the other wheel falling upon it, and most of the machinery was more or less damaged by the iron fragments. The cause of the disaster is not yet known, but it is supposed to have been a tooth of the great cog wheel breaking off and falling among the machinery. The extent of the damage cannot be known till all the machinery has been examined, but it will probably amount to several thousands of pounds. The accident will cause work to be stopped for four or five months. The loud report made by the wheel breaking was heard at some distance, and numbers of men rushed to the scene, fearing that a boiler had exploded.

A REMEDY FOR HYDROPHOBIA.

Professor Maisch recently presented to the Philadelphia College of Pharmacy a sample of *trompetilla*, a new remedy for hydrophobia, from Mexico, where it is said to have been successfully used in the cure of the terrible malady mentioned. It is administered in the form of a decoction. *Trompetilla* is obtained from the stems and branches of *Bouvardia triphylla*.

LIFE OF ATLANTIC CABLES.

The Anglo-American Telegraph Company have contracted for an additional cable, to be laid by the steamship Great Eastern during the coming summer. The expense to the Company will be about $2,500,000. The company now has four cables on the bottom, one of which, the cable of 1865, failed last year. From the fact that the company, instead of repairing that cable, is now about to lay a new one, *Engineering* concludes that repair is useless, and that the life of an ocean cable, of the kind used by the Company, is only seven years.

* * *

Adulterations of Coffee, Tea, and Pepper.

At a recent meeting of the Chemical Society, London, Mr. J. Bell gave some interesting particulars about the adulterations of these articles.

The adulteration of coffee can only be successfully accomplished after it is roasted and ground, but has, perhaps, been carried to as great an extent as in almost any other article of food. A very simple way of detecting the presence of chicory in coffee is to sprinkle a little of it on the surface of water in a test tube or wine glass, when each particle of chicory becomes surrounded with an amber colored cloud, which spreads in streaks through the water until the whole acquires a brownish tinge; with pure coffee, however, no cloud is produced until the lapse of about a quarter of an hour. Another method of detecting adulteration is by the depth of color obtained by the infusion of a given weight of the suspected article in water, and by the density of the infusion. The use of the microscope, however, is indispensable. The ash of coffee, remarkable for the minute quantity of silica it contains, and for the absence of soda, afforded a valuable indication of its purity.

ADULTERATIONS OF TEA.

Tea is adulterated to a very large extent, not only with leaves of various kinds, including exhausted tea leaves, but also with inorganic substances, such as quartz, sand, and magnetic oxide of iron; these latter substances are rolled up inside the leaf, and one sample of green tea examined was found to contain no less than 20 per cent of quartz and 8·6 of the magnetic oxide. The latter may readily be separated by grinding up the tea and removing the magnetic oxide with a magnet. The facing employed for green tea usually consists of French chalk and Prussian blue. In the preparation of exhausted tea leaves, they are rolled up with gum water and then dried, catechu being added in some cases to restore the astringency. The article known as the "maloo mixture" consists essentially of exhausted tea leaves. In searching for the presence of leaves other than those of the tea plant, the best method is to heat a small quantity of the suspected tea with water until the leaves are sufficiently softened to admit of being unfolded. They should then be spread out on a piece of glass and carefully examined as to the nature of the serrations and the character of the venation, also the appearance of the epidermis and the stomata, and the peculiarities of the hairs as shown by the microscope.

ADULTERATIONS OF PEPPER.

The two kinds of pepper, known in commerce as black and white pepper, are derived from the same plant, but differ in the latter being bleached, or having the husk removed by washing; but neither kind can be adulterated with success before it is ground. The most common adulterants for ground pepper are linseed meal, the husks of mustard seeds, rice, bean and pea meal, and the flour and bran of the ordinary cereals, ground chillies being added to restore the pungency. Some of these substances can be readily detected by diffusing the pepper in water, and pouring the mixture on to a muslin sieve. The deep red particles of the chili can then be recognized, and also the camphor-like fragments of rice. The mustard husks are known by their cup-like shape, while the smooth, shiny appearance of the linseed readily distinguishes it from the dull brown of the pepper.

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RECENT SCIENTIFIC PROGRESS IN EUROPE.

Sir G. B. Airy, Astronomer Royal and President of the English Royal Society, in the course of his address announcing the distribution of medals of that learned body to various eminent scientists, took occasion briefly to review recent events in the progress of Science, especially in Europe. While the discourse omits many discoveries and indeed lightly passes over all, as a necessary consequence of its synoptical form, it nevertheless mirrors sufficient of the doings of the past twelve months to be both interesting and valuable as a retrospect. We need not remark that, by reference to the volumes of our journal, many of the discoveries and researches noted will be found in fuller detail. Those ascribed in the following paragraph to English investigators constitute the principal communications to the Royal Society.

In astronomy, Messrs. Lockyer, Seabroke, and Huggins, have made extensive observations of the chromosphere and solar protuberances. Lord Rosse has produced a very complete treatise on the radiant heat of the moon, with all the modifications dependent on the lunar phases, and on the absorption produced by our atmosphere at different lunar altitudes. In cosmic science, Wells has found the unlooked for fact that the sea on the coast of Spitzbergen is warmer than on the opposite coast of Greenland.

Commander Wharton has verified the existence of a current running from the superficial waters of the Black Sea, through the Bosphorus and Dardanelles, that is met by a deeper current setting in the opposite direction. In biology, Messrs. Bastian, Ray, and Lankester have made important observations on life in organic infusions. In paleontology, Professor Williamson has examined the structure of fossil plants in coal, and Professor Owen has extended his investigations of fossil Australian mammifers. In botany, the most complex arrangements of leaves about a mother stem have been reduced to the primary formation of leaves ranged in two opposing directions by simple mechanical considerations. In chemistry, various analyses and experiments have been produced, but no new general principles established. In optics, Stears and Lee have described the effects of pressure on gases, by the alteration of the character of the spectra. In magnetism, some interesting facts have been adduced, relating to the magnetic influence in large iron tubes, such as tubular bridges. In mechanics, Sir W. Fairbairn has contributed valuable information on the durability of iron ships and strength of riveted joints, and Captain Galton has devised a mechanical apparatus which shows to vessels the best course to pursue.

The progress made elsewhere in Europe, President Airy sums up as follows: In astronomy, Leverrier has completed his theories of Jupiter and Saturn. Vogel and Plantamour have verified Huggins' discovery, by the spectroscope, of the traces of carbon in the composition of comets. Huggins has examined seven nebulæ, in order to discover whether their apparent movement be toward or away from our system. The research was facilitated by a coincidence of a spectral line of the nebulæ and a line in the spectrum of lead. The results indicated no appreciable motion. Father Secchi has remarked the sudden appearance of a brilliant point in the sun, which gave the spectrum lines reversed, indicating an ignition with a distortion of the lines, showing that the igneous mass was approaching us, in other words, that an explosion had taken place. Preparations by the various governments have been made for observing the coming transit of Venus, and by some German astronomers for observations of Flora, for measuring the solar parallax.

In geodesy, MM. Cornu and Baille have computed by experiment the mean density of the earth to be 5·56. In France, preparations are being made to repeat the observations of the great circle of the meridian.

In geography, the Challenger expedition may be noted as eliciting many important additions to our knowledge. Young's Congo expedition has explored the African continent in the neighborhood of the Congo river. A Swedish arctic expedition, blocked in the ice all winter, at the northern extremity of Spitzbergen, has been rescued. We have recently published an extended paper on geographical progress in 1874, to which the reader is referred for a fuller record of progress.

In anatomy, the most remarkable labor is the experimental discussion of the action of various portions of the brain, by Professor Ferrier.

In natural history, the works of Buller on New Zealand and of Viscount Walden on the Celebes, have added greatly to our knowledge. The new aquarium at Brighton, England, has also been the means of valuable observations of habits of marine animals.

In paleontology, Professor Von Brandt, of the St. Petersburgh Academy, gives the results of a long series of observations on the cetaceous fossils of Europe, a work which may form a supplement to Cuvier's great treatise. Dr. Burmeister, aided by the public museum of Buenos Ayres, has almost entirely reconstructed the extinct species originally indicated by the names of *toxodon*, *glyptodon*, and *macrauchenia*. Professor Owen has continued his reconstruction of extinct birds of New Zealand, and has discovered traces of a huge bird without wings.

In medicine, improved methods have been adduced for the study of contagious diseases, and for the investigation of "nervous storms." The spectroscope has been largely introduced into medical jurisprudence, and in surgery much valuable progress has been made.

In botany, Drs. Hooker and Bentham have continued the preparation of their catalogue of all known flowering plants, and the latter author has further prosecuted his studies of Australian flora. Considerable discussion has appeared as to the question of whether lichens are or are not parasites of a more simple form of algæ. Much attention has been given to the bacteridæ, and their supposed influence on the production of putrefaction. The mode of reproduction of fungi has been the subject of much examination and speculation. The curious fact has been discovered that the movement of the leaf of the *dionæa muscipula* produces electric phenomena analogous to those which accompany the motion of a muscle.

In chemistry, President Airy says that no fundamental theory has been announced, except in the doubt expressed, whether the existence of four isomeric lactic acids, in appearance demonstrated by Wislicenus, agrees with the actual theory of organic chemistry.

In optics, a new determination of the rapidity of light, by M. Cornu, shows the velocity in a vacuum to be 186,700 miles per second, mean solar time. Quincke in his experiments on diffraction has demonstrated that there is often an unexpected accompaniment of polarization.

* * *

TO NEW SUBSCRIBERS.

The present number (13) completes the first quarter of the year. It has been our custom to commence all subscriptions at the beginning of the year and to send the back numbers from the first of January. Hereafter the paper will be sent from the date of receipt of subscription; but to those who wish them, the back numbers from the commencement of the volume will be furnished, and the subscription dated from the first of the year.

* * *

EXHIBITING PHOTOGRAPHS.—The effect of photographic transparencies in the microscope, as well as on the screen, is greatly improved by placing a pale blue glass in the path of the illuminating beam. This corrects the brown or "foxy" tone which they too often present, and gives depth and richness to the shadows.

* * *

GOLD may be hammered into sheets so thin that 282,000 of them, placed one above the other, will only occupy the hight of one inch.

IMPROVED DIAGONAL PLANER.

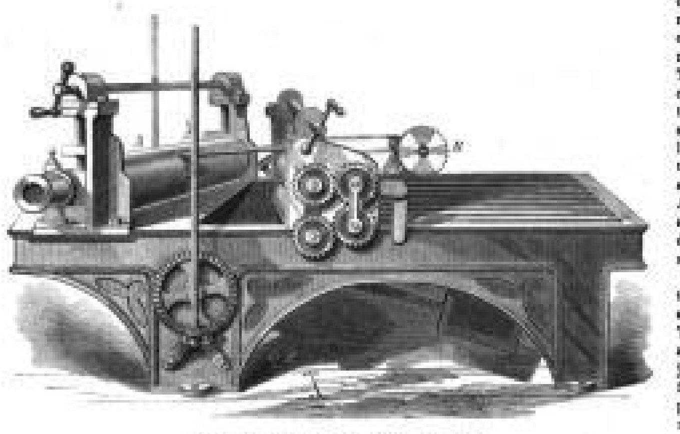
To mechanics familiar with the ordinary form of wood planing machinery, the only feature in the device herewith illustrated to which attention need be directed is the position of the cutter head, which, instead of being at right angles to the longitudinal axis of the apparatus, is placed at an inclination of about 45° to the same.

The inventor claims that, by this arrangement, surfaces presented by knotty cross-grained lumber, and by made up articles such as doors and blinds, are planed much more expeditiously and thoroughly, and with a saving of half the power required to turn the machines having cylinders at right angles.

Our engraving is prepared from a photograph of the apparatus in use in a factory at Whitehall, N. Y., which, we learn, is constantly in operation, smoothing doors and blinds at the rate of 500 per day. The articles are made up either of unsurfaced or surfaced lumber, and, after being glued together, are run through the machine in the same way and as easily as ordinary timber. It is stated that a boy, able to handle the doors, can pass fifty per hour twice under the cutters. The surface left upon the wood, it is claimed, is much smoother than is produced by ordinary planers, and hence labor and time are saved in finishing.

The frame of the machine is of iron. There is one set of six inch iron feed rolls and expansion gear. The diagonal cutter head is shown at A, and the cutters, three feet eight inches in length, make 2,300 revolutions. Motion is communicated by pulleys on a countershaft either over or under the apparatus, which must be detached from the latter on account of the angle of head and feed. A 3½ inch belt runs the cutter head, and a 2 inch belt actuates the feed, trimming, and jointing portions. The trimming saw, B, which cuts the wedges simultaneously with the smoothing operation, is shown, in the engraving, on the side of the machine close to the feed rolls. The capacity for work is stated as fifty 2 feet 6 inches by 6 feet 6 inches doors per day, and the cost of the operation is claimed to be less than one fifth that of hand labor. The inventor estimates that, if the machine be kept constantly in operation, its savings will be at least $20 per day of 10 hours.

Parties wishing to manufacture these machines for the proprietor of the patent, or on royalty for general trade, will address W. R. Norris, 115 West street, New York city.



NORRIS' DIAGONAL PLANER.

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THE QUICK SIGNAL RAILROAD LANTERN.

Not many months ago, a night train on one of our Eastern railways was interrupted in its progress by a serious obstacle in its path. Hardly had the nature of the difficulty been apprehended, and fairly before time had been given to consider a means of surmounting it, the unexpected sound of a swiftly following express was heard. The next instant the head light of the locomotive appeared around a curve. The conductor and brakemen of the stopped train were forward. Each realizing the imminent peril, instinctively sprang for a red light to make the danger signal, but too late. The colored lanterns were in the baggage car, in the rear, in fact everywhere but in their hands. In the few inevitable seconds of delay, the approaching train thundered over the intervening distance and crashed into the rear cars, scattering destruction and death. Fire added its horrors to the calamity; the slaughtered were numbered by dozens, and the loss of property measured by hundreds of thousands of dollars; and this because a single ruby light was not at hand at the instant it was needed.

Instances of this description might be readily multiplied; and possible cases, the imagination requires but little exercise to suggest. A switch tender, for example, suddenly discovers a rail broken, or that his switch mechanism has become clogged and refuses to operate. Not expecting any such circumstance, he has left his danger light in his station house; a lightning express may, at that instant, be due. The man has no time to go for his lantern, perhaps one or two hundred feet distant; down comes the train, and in a few moments a fearful accident has taken place. It might be supposed, in view of such facts and possibilities, that long ago railroads would have adopted some device which would render the presence of a danger signal in the hands of every employee on duty not merely obligatory, but as much a necessity as carrying of the ordinary white lantern. But there is no such invention at present in use. Separate lights are adhered to, and those on which the safety of life and property depend are still left here or there, in positions which, at one moment handy, may, at the next, be the most inconvenient and inaccessible.

We have lately had brought to our attention a new form of railway lantern which meets all the requirements indicated in the above lines. It is an invention which absolutely insures the carrying of a red light by every individual in whose hands is the common lantern. In other words, it is an arrangement whereby, in a fraction of a second, a white may be changed to a ruby light, and vice versâ, and this by mechanism so simple that failure is practically impossible. The details of construction will be readily understood from the annexed engraving.

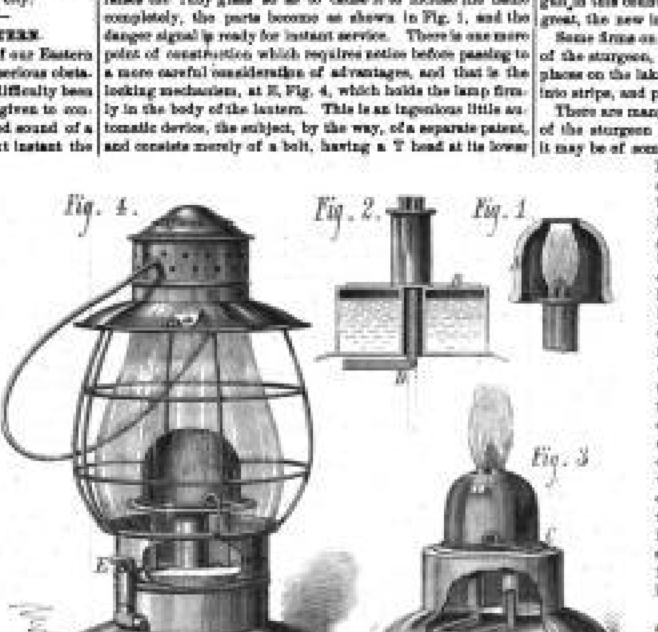
A, in Fig. 1, is an inverted cup of ruby glass surrounding the flame of the ordinary lamp and, of course, having an opening above for the escape of smoke, etc. This cup rests upon a small circular metal platform, B, Fig. 2, and is held in place by a wire spring, C, Fig. 3, catching on its rim. The platform, B, is movable, and has an aperture in its center for the wick tube. To its under side are attached rods which pass down in short tubes extending through the body of the lamp, as shown in section in Figs. 2 and 3. To the extremity of the rods is hinged a prolongation or handle, D, the ends of which are connected. The reader has doubtless already divined the operation of this simple contrivance. Ordinarily, when the piece, D, is folded over against the bottom of the lamp, the upper extremity of the wick tube extends a little above the ruby glass envelope, as represented in Fig. 3. The lantern is then a simple white light. If now it be desired to show a red illumination suddenly, the operator merely grasps the piece, D, bends it straight, and pushes it up. He thereby raises the ruby glass so as to cause it to inclose the flame completely, the parts become as shown in Fig. 1, and the danger signal is ready for instant service. There is one more point of construction which requires notice before passing to a more careful consideration of advantages, and that is the locking mechanism, at E, Fig. 4, which holds the lamp firmly in the body of the lantern. This is an ingenious little automatic device, the subject, by the way, of a separate patent, and consists merely of a bolt, having a T head at its lower extremity. The projection on the lamp is slipped into a right angled slot on the cylinder, first up, then to the right. As it is pushed upward it raises the bolt, then, on being turned, slides along its lower side, until the extremity of the horizontal part of the slot is reached. The bolt by this time is cleared, and, being no longer supported by the lug, falls back by its own weight, and locks the latter in place. The advantage of this is that the lamp can be inserted in an instant by feeling alone; and once caught, it is rigidly secured.

It is perfectly well understood by the inventor that, in order to insure the attention of users, of any apparatus which has been long and exclusively employed, to the merits of a new device, designed as a substitute, the novelty must be shown to have, not only great advantages, but advantages which will be productive of increased economy, in a word, that "have money in them." Hence the following brief calculation: A road, let it be supposed, uses 4,000 lanterns, of which 1,000 ruby ones is a fair proportion. It is proposed to substitute 3,000 lights of the form we have described, which serve already a double purpose. What is to be made by the operation? 3,000 common white lanterns cost about $3,000; 1,000 ruby lanterns cost $1,750. Oil for 1,000 ruby lanterns, at $15 per year each, $15,000. Total, $19,750. Cost of improved lantern, $2 each. Total, $6,000. Balance in favor of improvement, $13,750 per year.

Having thus, we think, sufficiently indicated the merit of this invention as a preventive of accident, and having shown its direct money value, a few minor though important advantages remain to be noted by way of conclusion. And first, the red light thus arranged gives a much greater illumination, one of three times the intensity of the common ruby lantern, the inventor tells us. This is probable, from the fact that the clear glass shade serves to diffuse and reflect the rays while not obstructing them; whereas, in the large shade of entirely dark glass, little more than the strong direct rays from the flames reach the eye, the others being absorbed in traversing the colored medium. At a certain distance, for instance, where simply a dot of red flame is seen in the ordinary lantern, this device would appear as a ball of red fire.

The fittings and construction of the lanterns generally are of improved description, and are of durable and strong material. The probabilities of breaking the red glass are, of course, much less than those of injuring the large red shade of the common form of signal; while, in event of such happening, the small cup can, necessarily, be much more cheaply replaced.

The inventor informs us that the invention has been ordered for use by every railroad to the managers of which its advantages have been exhibited. In order to afford a full examination, a single lantern will be sent by express, as a sample, to every road desiring to test it in actual employment. Further particulars may be obtained by addressing Mr. E. W. Taylor, sole agent, 271 Pearl street, New York city.



THE QUICK SIGNAL RAILROAD LANTERN.

* * *

Caviare.

This is an article of food prepared from sturgeon roes, and is extensively used in Russia, where it is considered a great delicacy. The preparation of this food has been begun in this country; and as our supplies of the fish are very great, the new industry promises to become important.

Some firms on Lake Erie have undertaken the utilization of the sturgeon, receiving immense numbers from various places on the lakes. They smoke the flesh, which is cut up into strips, and prepare the roe.

There are many peculiarities connected with the treatment of the sturgeon roes and their conversion into caviare; and it may be of some service to those interested in the trade to know how this is prepared in the White Sea and the Caspian, the headquarters of the business. According to Mr. Alexander Schultz, two kinds are made; one fresh or grained, and the other hard or pressed. In both cases the roes are placed upon a web or network, with narrow meshes, forming a kind of sieve stretched over a wooden hoop. Possibly a fine wire gauze would answer a still better purpose. The fish eggs are then forced through the meshes by pressing the white mass lightly, until nothing is left on the upper surface but the cellular tissue, the fat, and tendons. The eggs fall into a wooden receptacle placed beneath, and are next sprinkled with very fine salt of the best quality, the mass being stirred with a large wooden fork having eight or ten teeth. The quantity of salt necessarily varies, according to the season, from 3 to 1½; that is to say, in the month of August 3 to 5 pounds of salt are used to the pood (36 pounds) of roes, and 1½ to 2½ in the winter. The less the caviare is salted, the more it is esteemed.

At first the eggs, mixed with salt, exhibit a pasty appearance when stirred; but after each grain is thoroughly impregnated with the salt, the mass swells; and when stirred there is a slight rustling, similar to what would be the case in the stirring of fine particles of glass. This is a sign that the preparation is complete. The caviare is then placed in casks of linden wood, which imparts no unpleasant taste, as might be the case with most other materials.

To prepare the pressed caviare, a tub half filled with pickle, more or less strong with salt, according to the temperature of the season, is placed in the network. To secure a thorough impregnation of the eggs by the pickle, the mass is stirred with a wooden fork, turning it always from the same side. Then the eggs are strained out, and, when thoroughly drained, a quantity of about 100 pounds is placed in a sack and subjected to the action of a press, in order to remove all of the pickle, and convert the whole into a compact mass, as curd is converted into cheese. In thus preparing the caviare a number of the eggs are broken, and a portion of the contents runs off with the pickle, so that for each pood there is a

loss of 10 to 15 pounds. After removing the pressed caviare from the box, it is placed in casks, holding about 80 pounds, the interior of which is lined with napkin cloth, on which account in commerce this always bears the name of "napkin caviare." The better quality of the pressed caviare, that is to say, that which has been less mashed and salted, is placed in narrow, cylindrical cloth bags, and it is then called bag caviare. Caviare is also transported in boxes of tin, hermetically sealed. Fresh caviare is always preferred to the pressed, but is more expensive. Thus, at Astrachan, fresh caviare is worth from 30 to 33 roubles the pood, while the pressed is worth only 24. It is much more profitable to prepare the green caviare than the pressed, as it brings a better price, takes less salt, and requires less labor. There are exported every year from Astrachan about 11,000 pounds of caviare, which goes especially to Berlin, Dresden, and Vienna.

In commerce, the caviare from the roe of the Belouga sturgeon (*acipenser huso*) is more esteemed than that from the *a. stellatus*. The best of all is that of the sterlet (*a. ruthenus*); but this scarcely enters into commerce. The different kinds of sturgeon have roes differing in size, this depending upon the quality of fish, the season, and the particular place of capture. The roes of sturgeon which are taken in the sea, between the 8th of July and the 15th of August, are allowed to remain only a few hours in the pickle, and they are then removed, and placed, without being pressed, in casks of 5 to 10 poods. If, on touching the roes, they are found to be tender, and the ovaries have already begun to decay, the roe, ovaries and all are thrown into the pickle, so that the whole may be impregnated with salt. This is the most inferior quality, and is shipped in casks of 27 poods each, and is worth only three or four roubles per pood. This is known as summer caviare. The total amount of caviare obtained in the Caspian Sea fisheries amounts in one year to 130,000 poods (about 5,000,000 lbs.) worth 1,390,000 roubles, or $1,108,000.

THE CLEPSYDRA IN ROME.

It is not very often, in these progressive days, that we find the ancient methods of measuring time in actual employment. The sun dial, it is true, occasionally serves as an ornament to some country lawn, but little dependence is placed on its slowly creeping shadows. The hour glass has disappeared from the pulpits of the parsons; for twenty minute sermons, instead of many-headed dissertations prolonged through hours, are now sufficient for the spiritual needs of their flocks. The divided candle exists only in history, and is linked with the story of good King Alfred. But the water clock remains; not in this country, to be sure, but where it was used a thousand years ago. Julius Cæsar, tradition tells us, found by its aid that the summer nights in Britain are not not the same length as those in Italy. Cicero relates that the length of speeches made by senators was regulated by clepsydræ kept in the senate chamber; and the same parliamentary practice, which now holds in our own legislative halls, of a member yielding the floor for a certain number of minutes of his time to another speaker then existed, for a grave senator often gave so much of the water as remained in his clepsydra to a colleague, who was thus enabled to obtain a longer or an extra water time for his speech than would have been otherwise at his command. If a legislator in those days, however, was interrupted by absurd questions—something after the fashion which occasionally appear when our learned representatives indulge in discussions on patents—or was embarrassed by the somnolent habits of his associates during a long-winded speech, he did not ask permission to have the latter printed and distributed at the country's expense, but simply stopped the flow both of his water clock and his rhetoric, and calmly waited until the house became ready to listen to his further remarks. The clepsydra of antiquity, in fact, while really a very useful and ingenious invention, of course was very crude in form, and hardly of the nice construction of the apparatus represented in our engraving. The clock there shown stands in a pond in the Pincio, the latter being a very elegant public park located on the summit of the Pincian Hill, one of the famous seven eminences on which Rome is built. The grounds are a favorite resort for the people, and serve the same purpose to the city that Central or Fairmount Park does to New York or Philadelphia.

The apparatus, in its present form, is the invention of Padre Embriaco, a Dominican monk; and from the pages of *L'Illustrazione*, a new illustrated weekly, published in Rome—a significant fact, by the way, of the influence toward progress exerted by the new *régime* in united Italy—we take both our illustration and the following brief description:

The water is led by pipes to a reservoir in which a constant level is maintained, and from an orifice in which the stream escapes into a receptacle divided into two compartments. Below the latter is an arrangement in the form of an anchor, the curved portion of the latter serving as a rocker on which the divided receptacle vibrates. This oscillation takes place under the entering stream; so that when one compartment is carried down by the weight of water within, the second is raised to receive its supply. A pendulum, beating *seconds*, is suspended from two springs, parallel to and equidistant from the resting point of the rocker, and regulates the movement of the receiver. The springs are prolonged in the direction of tangents to the curve of the anchor arms and maintain the pendulum in motion with a constant force, so that each oscillation of the latter corresponds to one of the rocker and of the receiver. The water from the latter falls upon balanced mechanism which is so constructed as to oscillate every second minute, and to transmit motion to a suitable train of wheels, which move the hands upon one or more dials in the usual way.

The sounding apparatus consists in a cylindrical reservoir, which is suspended by chains to the axis of a wheel and is arranged to empty itself every fifteen minutes. Its weight turns the wheel and thus sounds the hours and the quarters. Water is carried to the reservoir when empty, by a simple siphon arrangement.

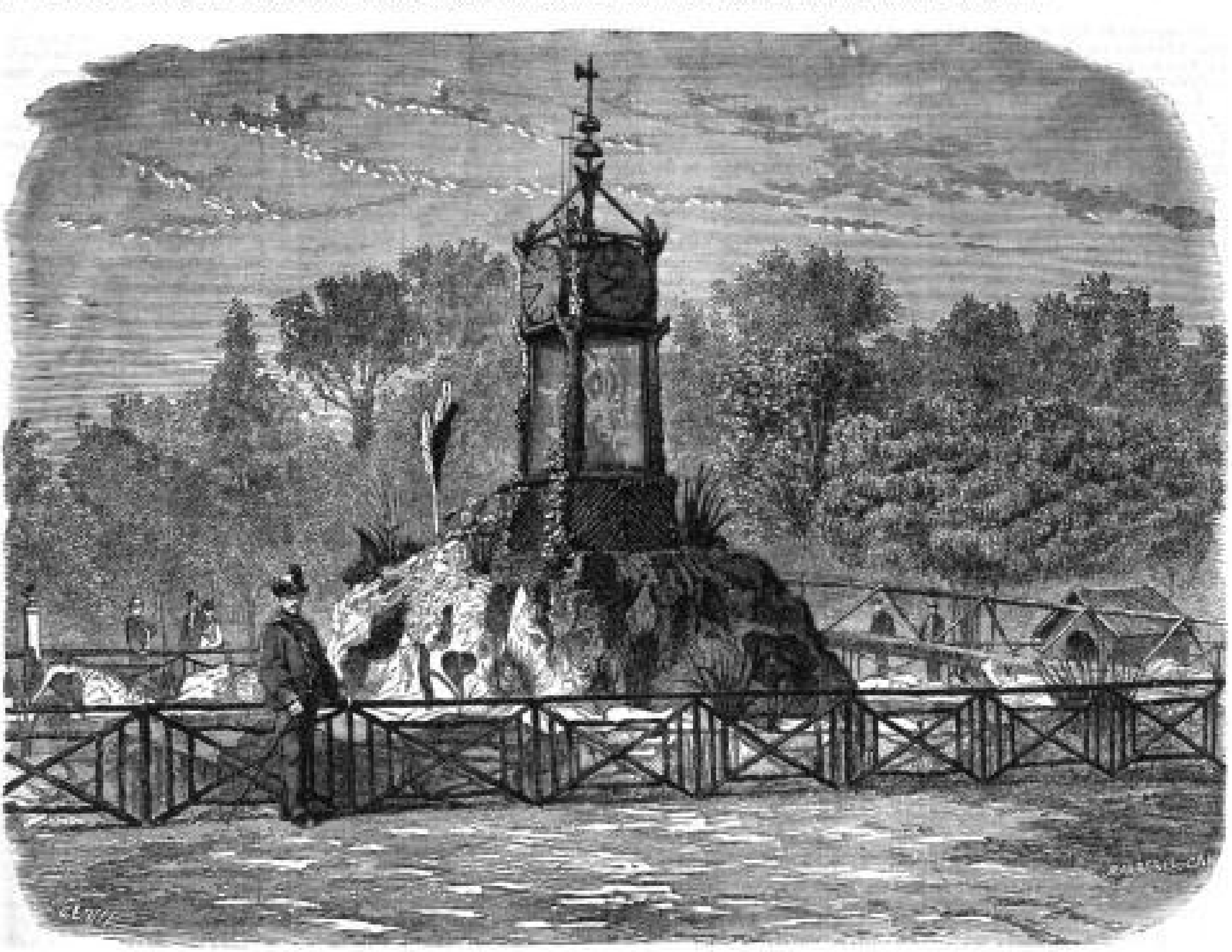
The case of the clock, as represented in the picture, is of cast iron, made in a handsome rustic design, in excellent keeping with the general surroundings. We should imagine our inventors could easily devise a simple form of similar apparatus, which, mounted in some appropriate casting from the iron founders who make that class of work a specialty, would form an elegant and useful ornament to either public or private pleasure grounds.

Formation of Octahedral Borax.

It is known that borax forms two hydrates—the one containing 5 equivalents of water, and crystalizing in regular octahedrons; the other containing 10 equivalents, and forming oblique rhombic prisms. The octahedral crystals are commonly considered stable only at relatively high temperatures. M. D. Gernez, however, finds that both the prismatic and the octahedral forms can be produced at low temperatures. The temperature of 56°, which has been indicated as the inferior limit for the production of prismatic borax, is in reality only a temperature near the higher limit at which the production of prismatic borax has been observed, since this salt loses a part of its water at this temperature.

Absorption of Dry Ammoniacal Gas by Cane Sugar.

On employing absolutely dry sugar, and submitting it to the action of the current of ammoniacal gas, dried over a long column of quick lime, the sugar becomes at first opalescent, and takes the waxy consistence described by Raspail, but in the course of twelve hours it liquefies, and flows on the surface of the tube in which it is contained: 100 parts of sugar absorb 7·83 of ammonia. On exposure to the air, the sugar loses the ammonia which it had absorbed. At the end of three months, the sugar retains only about 0·37 per cent, and has still a very pungent flavor. Glucose similarly treated liquefies very rapidly, becoming colored, and forming a crystalline product.—*M. E. Laborde.*



CLEPSYDRA OR WATER CLOCK, ON THE PINCIAN HILL, ROME.

Seasonable Hints on Gardening.

Winter has no sooner passed than every one possessing a patch of land considers how he will cultivate it in the coming season. In the country, the farmer is already at work with his subsoil plough, and he has decided which acres shall be sown with grain and which with vegetables. Parties owning country seats adjacent to the towns and villages along the Hudson River, in Connecticut, and Jersey, says the *Commercial Advertiser*, are just now making trips to their rural homes, to give directions concerning the vegetable gardens and flower beds. Fancy gardening has of late years become so fascinating to men of means that much money is annually invested in vegetables which cost, after they are ripe, their weight in gold. One of our representative citizens estimated the value of his cabbages raised at his country seat to be twelve dollars apiece. However, the pleasure of "seeing them grow," of exhausting the skill of expert horticulturists upon them, of feeding the soil around them with the finest guano, and then of believing that, when grown, they are a little larger and better flavored than any raised by neighbors, is the hight of satisfaction.

It is becoming a favorite employment with ladies to superintend their flower and vegetable gardening to devote a certain portion of the spring days to selecting and purchasing the choicest seeds, and to oversee their starting in hot beds. The early radishes and lettuce found on so many tables before their regular season are often the product of the labor and care of the female members of the family. Since window gardening has been so successfully introduced by our leading florists, and ladies have given their attention to planting and nursing flowers, the study of horticulture has been pursued by many of them until they understand the science of propagating plants.

WINDOW GARDENING.

This is an especial appropriate season of the year to make the windows beautiful with plants. There is great pleasure in bringing spring indoors by collecting the flowers which are now in bloom in the hot house, and planting them in the handsome boxes or baskets made for that purpose. Window gardening is delightful in winter time; nevertheless, there the hardiest plants suffer more or less for fresh air. At this time there are hours at noon when the windows can be thrown open, and the plants which have been housed in greenhouses will apparently speak their thanks for the drink of fresh air and the contact with the sun's rays. The plants now in blossom are the hyacinth, narcissus, tulip, daffodil, cineraria, heath, violets, lilies of the valley, and several other varieties which are charming as companions in the sitting room. Shallow cigar boxes are very useful for planting seeds, and can be arranged to look nicely in the windows. In two or three weeks from this time, it will be proper to plant mignonette and sweet elysium, those fragrant and most suitable plants for window boxes. The vine seeds should then be put in the hanging baskets. They are for the most hardy vines. The morning glory is easily cultivated and is exceedingly graceful in leaf and flower. It will grow readily in any sunny window. Violets, early flowering snowdrops, anemones, forget-me-nots, and primroses are the best plants for culture in outside window boxes. The exquisite loveliness of the rose will not permit it to be omitted from the window garden, notwithstanding it is with difficulty kept in a thriving condition. Tea and China roses are the best adapted for culture in boxes.

For keeping plants healthy which are indoors at this season, close the windows of their room by three o'clock. Great attention must be paid to their cleanliness to promote their rapid growth. Flower pots need washing on the outside weekly. Never leave water standing in the saucers of the flower pots. Water must be given to the plants plentifully in these spring months. Rain water is always best for vegetation. Stimulate plants once a week with liquid manure. A large sponge is good for a watering pot for house plants. This is the month to prepare the ground for a successful crop of vegetables and flowers.

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The Warm Springs of Costa Rica.

A. v. Frantzius states that these springs, more than 30 in number, may be regarded as a continuation of the remarkable series of warm mineral springs discovered by Humboldt in Venezuela, and extending for 180 miles from Cape Paria to Merida. The Costa Rica springs begin indeed 13 degrees of longitude farther west, but are situated under nearly the same parallel of longitude, namely, 10° N. in a strip of land running for 30 miles from east to west. Most of them occur in narrow mountain gorges on the banks of rivers, or are even overflowed by the rivers, so that they are visible only in the dry season. Their temperature is higher in proportion as they are situated at a lower level. The highest observed temperature is 157·1°. The water contains some salt.

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Mr. E. P., a correspondent, adds his testimony to that of Mr. J. A. Field, as to the value of using glue as a healing agent for cuts, bruises, etc. "I have used glue for this purpose for the last 22 years, mostly in the cabinet shop, and never employ anything else. I have received many severe cuts and bruises, and never lost any time, to speak of. Often a piece of thin cloth is sufficient after gluing over the wound. I use the best imported glue. I never took cold in a wound yet, and it is the most speedy healing agent I ever employed. Last autumn an acquaintance of mine came in the shop with his hand all bandled up. He had received a severe bruise on the back of his hand, and took cold in it; and it was badly inflamed. I spread a glue plaster over the wound and bound a moistened cloth over to keep the glue from becoming dry. In one week his hand, was entirely well."

The Laughing Plant.

The London *Garden* copies, from Palgrave's work on Central and Eastern Arabia, an account of a plant whose seeds produce effects similar to those of laughing gas. It is a native of Arabia. A dwarf variety of it is found at Kaseem, and another variety at Oman, which attains to a hight of from three to four feet, with woody stems, wide-spreading branches, and bright green foliage. Its flowers are produced in clusters, and are of a bright yellow color. The seed pods are soft and woolly in texture, and contain two or three black seeds, of the size and shape of a French bean. Their flavor is a little like that of opium, and their taste is sweet; the odor from them produces a sickening sensation and is slightly offensive. These seeds contain the essential property of this extraordinary plant, and, when pulverized and taken in small doses, operate upon a person in a most peculiar manner. He begins to laugh loudly, boisterously; then he sings, dances, and cuts all manner of fantastic capers. Such extravagance of gesture and manner was never produced by any other kind of dosing. The effect continues about an hour, and the patient is uproariously comical. When the excitement ceases, the exhausted exhibitor falls into a deep sleep, which continues for an hour or more; and when he awakens, he is utterly unconscious that any such demonstrations have been enacted by him. We usually say that there is nothing new under the sun; but this peculiar plant, recently discovered, as it exercises the most extraordinary influence over the human brain, demands from men of science a careful investigation.

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Chemical Composition of Fuel.

Professor T. S. Hunt gives the results of the analyses by various chemists, taken chiefly from Bischof's "Chemical Geology," showing the relative proportions of the elements in wood, peat, coal, asphalt, and petroleum. He states that the "nitrogen, which, in most cases, was included with the oxygen in the analyses, has been disregarded, and the oxygen and hydrogen, for the sake of comparison, have been calculated for twenty-four equivalents of carbon."

1.	Vegetable fiber or cellulose......	$C_{24}\ H_{20}\ O_{20}$
2.	Wood, mean composition.........	$C_{24}\ H_{18·4}\ O_{15·4}$
3.	Peat (Vaux)....................	$C_{24}\ H_{14·4}\ O_{10}$
4.	Peat (Regnault).................	$C_{24}\ H_{14·4}\ O_{9·6}$
5.	Brown coal (Schrötter)..........	$C_{24}\ H_{14·2}\ O_{10·6}$
6.	" (Woskressensky)......	$C_{24}\ H_{12}\ O_{7·6}$
7.	Lignite (Vaux).................	$C_{24}\ H_{12·2}\ O_{8·6}$
8.	Lignite passing into mineral resin (Regnault)...................	$C_{24}\ H_{12}\ O_{7·3}$
9.	Bituminous coal (Regnault).....	$C_{24}\ H_{12}\ O_{3·2}$
10.	" " "	$C_{24}\ H_{10}\ O_{1·7}$
11.	" " "	$C_{24}\ H_{9·4}\ O_{1·3}$
12.	" " "	$C_{24}\ H_{8}\ O_{0·8}$
13.	" " " (Kühner and Gräger)..........	$C_{24}\ H_{7·4}\ O_{1·2}$
14.	Bituminous (mean comp.) (Johnson).......................	$C_{24}\ H_{9}\ O_{2}—O_{1}$
15.	Albert coal (Wetherill).........	$C_{24}\ H_{18·8}\ O_{1·6}$
16.	Asphalt, Auvergne..............	$C_{24}\ H_{17·2}\ O_{2·2}$
17.	" Naples..............	$C_{24}\ H_{14·8}\ O_{1}$
18.	Elastic bitumen, Derbyshire (Johnson).....................	$C_{24}\ H_{24}\ O_{0·3}$
19.	Bitumen of Idria...............	$C_{24}\ H_{8}$
20.	Petroleum and naphtha.........	$C_{24}\ H_{26}$

These analyses are very attractive and valuable.

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Christian Sharps.

Christian Sharps, inventor of the celebrated breech-loading firearm known throughout the world as Sharps' rifle, died recently at Vernon, Conn., in the 61st year of his age. Sharps' rifle was, for a long time, the only effective breech loading gun in use, and its remarkable efficiency for military purposes soon rendered the old style of muzzle-loaders obsolete. Sharps' original patent was granted in 1848, before the invention of metallic cartridges, when paper cartridges only were used, fired by percussion caps. The inventor's task was to make an effective breech loader, in which paper cartridges and caps could be employed, and this is what Christian Sharps successfully accomplished. The breech plug was made to slide vertically; its lower edge was sharpened into the form of a knife. The operation was such that the breech plug, in descending to its place, cut off the rear end of the paper cartridge, leaving the powder open to the flame of the percussion cap. Subsequent improvements on the gun were made by the inventor, which increased its value. Mr. Sharps was the inventor of many other useful devices besides firearms, from all of which others reaped pecuniary benefits, his own share being small. He was a most kind-hearted man.

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Contamination of Water by Copper Pipes.

E. Reichardt points out that most waters take up more or less metal from iron and lead pipes, and that copper is not in any way a better material. Water which, when freshly laid on in 1859 through copper pipes, contained 7·2 parts of copper in a million contained 0·8 of copper per million in 1872. Even this latter water gave a perceptibly green metallic soap. Although the quantity has diminished during the thirteen years, yet at the end of that time a most objectionable amount of copper was still taken.

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A HAM, well packed in pulverized charcoal, after the usual smoking, will keep for years. Butter in pots, well surrounded with charcoal, will keep for twelve months. Each atom of charcoal can absorb 1,000 times its bulk of deleterious gases—*Hall's Journal of Health.*

Treatment of the Teeth.—Root Filling.

Many of the most experienced and able members of the profession still advocate the use of solid gold filling in roots as the best and most reliable method. Admitting the value of such a filling, I think we can, at present, entirely do without it.

One object in filling the pulp canal is to prevent the collection of fluids, and to avoid the deleterious effects resulting therefrom. If we can accomplish this more readily by cheaper processes, it is our duty to do so.

This, however, is not my main reason for objecting to gold fillings. Observation has taught me that many times periostitis, and even the loss of the tooth, ensues, when the operation has been performed in the best manner and by the most experienced dentists. I therefore resolved at the commencement of practice to attempt another method, not being aware, at that time, that this practice was being used by others.

Considering the relations of dentistry to the public, and those of the latter towards dentistry, it is not surprising that at the present time, in Germany, we have a larger proportion of dead and exposed pulps to treat than have our colleagues in America.

I shall not dwell upon the preparatory steps necessary to be taken in different cases, as these are familiar to the profession; but when the root is in a proper condition for filling, I proceed as follows:

Select a thread of lint, separate or loosen the fibers as much as possible, and then moisten it with chloride of zinc from the cement boxes; then rub oxide of zinc well into it, omitting one extremity of the lint, which is reserved for the application of a small quantity of carbolic acid. The thread is simply the medium for conveying the cement to the extremity of the canal, and is entirely imbedded in it. The end of the lint saturated with carbolic acid is, of course, the first inserted, and is carried directly to the apex. After the root or roots are filled, the cavity in the crown is temporarily closed with cotton and sandarac, and an appointment made with the patient several days subsequently. If, in the meantime, the tooth has been perfectly comfortable, and the patient in a healthy condition, I insert a gold filling in the crown cavity. If, on the other hand, the pulp had been deprived of vitality for a long period, and the tooth easily irritated during preparatory treatment, I fill the cavity with cement, and dismiss the patient for the time. By operating in this cautious manner, I am able to assert that I never had periostitis occur in the large number of teeth treated in this way.

As none of these teeth had given any trouble, I never had an opportunity to satisfy myself in regard to the condition of the root and the filling until, by an unfortunate accident, a young patient split off the labial surface of a first superior bicuspid, treated in this manner two years previously. The tooth was extracted, at her request. On splitting the root to the apex, I found, as I expected, the filling hard and perfect, and the periosteum in a healthy state.—*Dr. Henricke Hirschfeld.*—*Dental Cosmos.*

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A RED INK WHICH RESISTS THE ACTION OF MOST CHEMICALS.—This ink is a solution of carmine in soluble glass, and must be kept in a bottle, with a well oiled cork.

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DECISIONS OF THE COURTS.

United States Circuit Court—Southern District of New York.

PATENT REFLECTORS.—ISAAC P. FRINK *vs.* GEORGE PETRY *et al.*

[In equity.—Before Blatchford, Judge.—Decided January 27, 1874.]

The plaintiff's patent was for a reflector of which the principal features were a metallic surface above the source of light, reflecting the light downward below its source, and a glass surface in contact under the other, serving as a lining to it, and aiding in reflecting the light, with a space between the two surfaces for the circulation of air and ventilation; and his first claim was, in substance, for a reflector having a reflecting surface of glass in combination with another reflecting surface placed above the first with a space between the two for air, etc.

His second claim was in these words: "The combination with the metallic body of a reflector of a glass covering or lining therefor applied in sections or panels, substantially as and for the purposes described."

Both claims were held to be infringed by a reflector in which the reflecting surface was composed entirely of silvered glass contained in a metallic case or cover, large portions of which were cut away, and the inside of the rest was covered with paint.

Prior to the plaintiff's invention one Boyle had obtained an English patent for a reflector, in which the reflecting surface consisted of silvered glass in sections arranged in several series around the light, one series above another, and diminishing in circumference upward, and all contained in a wire or metal frame.

As it had no upper reflecting surface, it was held to be no anticipation of the plaintiff's first claim.

In view of Boyle's patent the second claim was interpreted by reference to the specification as intended to embrace a metallic body which throws the light down below its source, and which is lined or covered with glass that may be applied to the metallic body by molding or blowing. If not so [illegible] in sections or panels, thus construed, the second claim was held not to be anticipated by Boyle's patent.

The employment of a glass lining over the reflecting surface of a known reflector is patentable, since it protects the surface and increases the reflected light.

E. W. Dennison and *W. H. Andrus*, for the plaintiff.

J. A. Fisher, [illegible], [illegible], and *[illegible]*, for the defendants.

IMPORTANCE OF ADVERTISING.

The value of advertising is so well understood by old established business firms that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it; upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation, among the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the vendors of any new article in the mechanical line, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of more than 42,000 copies per week, which is probably greater than the combined circulation of all the other papers of its kind published in the world.

NEW BOOKS AND PUBLICATIONS.

SCIENCE PRIMERS: CHEMISTRY. By H. E. Roscoe, Professor of Chemistry in Owen's College, Manchester. PHYSICS. By Balfour Stewart, Professor of Natural Philosophy in Owen's College.

These two volumes are likely to prove very valuable to teachers of juvenile science classes, as they begin the subjects of which they treat, and assume that the mind of the pupil is still open to initial impressions. It is gratifying to find such men as these eminent authors occupying themselves with this work, which, though highly necessary and important, is too generally slighted as being unworthy of the attention of great minds.

QUADRATURE OF THE CIRCLE, containing Demonstrations of the Errors of Geometers in finding the Approximations in Use, with an Appendix, etc. To which are added: Lectures on Polar Magnetism, and Non-Existence of Projectile Force in Nature. Price $2.50. By John A. Parker. New York: Wiley & Son, 15 Astor Place.

This book is another contribution to the literature of the search for the infinite and the discovery of the undiscoverable. It resembles most other treatises on the subject in that it assumes much and then proceeds to point out the symmetry and beauty of the assumptions. The author claims to have demonstrated, in his work, the exact distance between the earth and the sun, in advance of the observations of the coming transit of Venus.

THE CARRIAGE MONTHLY, a Practical Journal for All Engaged in Carriage Building. Per annum, $3. I. D. Ware, 737 Sansom street, Philadelphia, Pa.

A well written, liberally illustrated technical journal of the highest class. It covers the whole art of carriage building, design, construction, upholstery, painting, and varnishing; and its working drawings are very numerous and explicit.

THE EMERY GRINDER. Vol. I, No. 1. Stroudsburgh, Pa.

The Tanite Company, whose special manufactures are known over both hemispheres, forward us the first number of a monthly publication issued by them. One of the chief features in it is the announcement of premiums, $50 for the best, and $25 for the second best, original essay, of a practical nature, on the exact results attained by the use of solid emery wheels and emery grinding machinery. The subject is a good one, and deserves the attention of mechanics.

AN ELEMENTARY TREATISE ON STEAM. By John Perry, B.E., Whitworth Scholar, Fellow of the Chemical Society and Lecturer in Physics at Clifton College. Price $1.50. New York: Macmillan & Co., 38 Bleecker street.

A complete practical handbook, concise in style, explicit as to facts, and convenient in form. It embodies the latest data on all branches of the perpetually progressing science.

LINCOLN AND SEWARD: Remarks on the Memorial Address of Charles Francis Adams on the late William H. Seward. By Gideon Welles, Ex-Secretary of the Navy. New York: Sheldon & Co.

Ex-Secretary Welles attempts herein to defend the late President Lincoln from some attacks, supposed by him to be implied in Mr. Adams' eulogium of the deceased Ex-Secretary of State. It is a political matter, and our readers will not expect any expression of opinion from us on the subject.

STUDIES OF BLAST FURNACE PHENOMENA. By M. L. Gruner, President of the General Council of Mines of France, and lately Professor of Metallurgy at the Ecole des Mines. Translated with the Author's Sanction, with an Appendix, by L. D. B. Gordon, F.R.S.E., F.G.S., Emeritus Regius Professor of Civil Engineering and Mechanics in the University of Glasgow, etc. Price $2.50. Philadelphia: Henry Carey Baird, 406 Walnut street.

Professor Gordon has here added to our literature of iron metallurgy the master treatise on the construction of the principal apparatus, a book which, as he truly says, is not written in a style that "those who run may read," but which is worth the labor of a thorough investigation by all who study the economy of the processes of iron smelting. It will be largely read in this country, and its teachings reduced to practice in many of our thriving iron manufacturing centers.

THE SCIENCE OF LANGUAGE, or the Seven Hour System of Grammar. Third Edition. $1.00, bound; 50 cents in paper. By Professor D. P. Howe, Union College, Boston, Mass.

A very compendious elementary treatise on the parts of speech and their uses, written with clearness and originality.

THE UNITARIAN REVIEW AND RELIGIOUS MAGAZINE. Edited by the Rev. Charles Lowe. Vol. I, No. 1. Per Annum, $3. Boston: Leonard C. Bowles, 26 Bromfield street.

This new comer is evidently intended to appeal to the minds and tastes of the higher intellects of the class of theologians whose name it bears. Most of the articles in this monthly number are well written, temperate, and thoughtful; and the editing shows much appreciation of literary merit.

Messrs. Glendinning, Davis & Amory, bankers and brokers of 27 Wall street, in this city, have recently compiled a chart of stock quotations for the past eleven years. The highest and lowest quotations, monthly in each year, since January 1, 1863, are shown of some of the principal railroad, steamship, express, and telegraph shares. References explanatory of the course of the market, and memoranda of the leading and remarkable events in speculation, during the above period are added. The chart is prepared from official and private sources, and affords a large amount of information not, we believe, otherwise attainable, which must be both of interest and value, not only to those engaged in banking and other financial pursuits, but to investors generally. It is published and for sale by Trow & Anderson, 27 Wall street, New York, and is mounted on muslin and rollers. The price is $[illegible].

Inventions Patented in England by Americans.

(Compiled from the Commissioners of Patents' Journal.)

From February 11 to February 25, 1874, inclusive.

BALL CASTER.—J. Johnson, Brooklyn, N. Y.
BOTTLE STOPPER, ETC.—S. Thompson (of Brooklyn, N.Y.), London, Eng.
CAST METAL ROLLS, ETC.—H. Smith, Pittsburgh, Pa.
DRESS PIN.—F. Armstrong (of Waterbury, Conn.), London, England.
FENDER FOR VESSELS.—C. Wagner et al., New York city.
GAS RETORT JOINT.—J. R. Floyd, New York city.
STABLE [illegible].—G. H. Corby, Richmond, Va.
[illegible] COFFEE.—T. S. Hunt, Boston, Mass.
SEWING MACHINE.—G. W. Baker, Wilmington, Del.
STRETCHING BOOTS, ETC.—D. Harris, St. Louis, Mo.

Recent American and Foreign Patents.

Improvement in Refining Petroleum and other Oils.

Emil Schalk, New York city.—In refining petroleum, the product of distillation has, up to this time, been first treated with sulphuric acid (SO_3), the acid then being washed out with water, and the product next treated with caustic soda, or the ammonia of commerce. It is now proposed to use sulphurous acid (SO_2), either gaseous or dissolved in water, for the first treatment, instead of the sulphuric acid, and for the second treatment ammonia gas instead of the caustic soda or ammonia of commerce. Both is to be employed in the common intermittent process, in which the oil is treated in a single tank, and in the continuous process described in the patent (No. [illegible]) granted the same inventor, either using the same apparatus described therein, with the exception of larger conduits for conducting the gases to the agitators, or the following: First, a vertical cylinder lined with lead or iron, filled with empty bottles, glass or earthen balls, to afford the largest possible amount of surface. Over these balls or bottles the oil is allowed to flow downwardly, and at the same time the sulphurous acid is caused to enter at the bottom of the cylinder and pass up through in contact with the falling oil. From the bottom of this cylinder the oil is drawn into a tank, to separate the clear oil from any acidified portion, and then, by means of a pump or by air pressure, brought to a second cylinder, similar to the first, where it is subjected to the action of the ammonia gas in the same manner. Finally, in a third cylinder similarly constructed, the oil ascends from the bottom upward by a pump, and at the top a stream of water is let in, to wash out any remaining acid or ammonia, or combination of the two. From this last cylinder the oil passes to the bleaching tanks.

Improved Fix for Furnaces.

Lars Nelson and Thomas McNeff, Chicago, Ill.—This invention consists in a compound of fire clay, fire sand, and ground coke. The above ingredients are finely pulverized and mixed together with sufficient water to form a mass of the consistency of common mortar. This can be applied when the surface is hot, and without interrupting the usual operations of the furnace. No fire bricks are required, and no time is lost in lining or repairing the lining of the furnace.

Improved Shoe.

Edwin C. Burt, New York city.—The outer sole has a channel located at a short distance from the edge, and beveled upwardly to the top of the middle, which has the full thickness of ordinary soles. When the soles are to be united to the upper, the latter is sunk in the channel of the outsole, and the insole caused to overlap said channel, thereby doing away with the usual projection of upper and of insole, while the middle or wearing part of the outsole is preserved in its full thickness. By this construction the upper is very effectually protected and rendered more durable, while a closer joint is formed for the exclusion of water and dust.

Improved Well Tube Clamp.

Ephraim Shaw and Joseph H. Beatty, Tar Farm, Pa.—This invention consists in combining, with the collar or socket of a well tube clamp, a pivoted hasp, which is hinged to a bolt-shaped extension of said socket, and hooked at its outer or free end, so as to engage with a second extension of the socket. Provision is also made for adjusting the latch in respect to the socket, through the medium of nuts. The invention further consists in applying to the inner side of the pivoted latch one or more serrated griping jaws, which serve to securely hold the object inserted into the socket.

Improved Rotary Churn.

Charles M. Gilpman, Osceola, Iowa.—This invention is an improvement in the class of rotary churns in which the dasher is arranged obliquely, and relates to the relative construction of the dasher and churn box. The former is composed of a series of bars which are arranged inclined to the shaft, forming thus the outline or skeleton of a truncated cone, and the latter is of irregular polygonal shape corresponding thereto, so that the dasher may be placed diagonally, and, in rotation, thoroughly agitate the cream from the bottom. Interfering or cross currents are thus created, thereby speedily producing the desired result.

Improved Hog Trap.

John H. Foggs and George H. Overshiner, Elwood, Ind.—This invention has for its object to furnish an improved device for catching hogs and holding them securely while being ringed, marked, etc. The hog, in seeking to escape through a gap in the trap, steps upon a tilting board, the tilting of which pitches him forward so that his neck may be between levers. The levers, by suitable mechanism, then close and clasp the hog around his neck, and around his body in the rear of his fore legs, where he may be held securely by hooking the straps upon pins.

Improved Car Axle.

George W. Millmore, Janesville, Wis.—This invention consists, first, in so combining a revolving sleeve with a solid stationary axle that the lubricating material is introduced into the oil chamber between them from oil cups attached to the bearers; secondly, in an elastic or flexible ring on the journal of the axle box, constructed and arranged so as to be compressed on the axle, to prevent the escape of the lubricating material; thirdly, in a novel oil feeder, attached to the lower side of the fixed axle; fourthly, in such an adjustment of the axle sleeve and bearers that the friction caused by lateral motion is taken up on a bearing surface near the center of motion, and within the limits of the sleeve where the oil is stored; fifthly, in certain spaces as provision for lateral motion.

Improved Combined Grate and Ash Sifter.

George Washington Pettit, Fairmount, West Va.—This invention relates to a pivoted weighted grate or screen plate and a coal and cinder pan, which is cut out on one side to adapt it to receive and support the front end of the same, in combination with a stationary grate, forming the bottom of a fire pot. The pieces of coal or cinders falling from the grate will be conducted, by the screen, into the pan, while the ashes fall through the perforations of said screen, thus becoming separated from the matter that may yet be used as fuel.

Improved Eaves Trough Hanger.

Samuel W. Jones and Benjamin D. Evans, Nelsonville, Ohio.—This invention is an easily applied hanger for eaves troughs, and consists of splitting and twisting a piece of hoop iron of suitable strength, and attaching the twisted ends to the eaves trough, while the main piece is applied to the roof at a suitable inclination.

Improved Center Board for Boats.

Thomas Hartley, Gilman, Ill.—This invention relates to vessels which are expected to carry sail in deep or shallow water, and consists in a novel means whereby the tendency to capsize is to a great extent obviated.

Improved Fire Place Stove.

John B. Gildersleeve, Baltimore, Md.—This invention relates to stoves set in fire places for the purpose of heating the apartment in which the fire place is located, and also one or more thereabove. These stoves are ordinarily constructed with two horizontal and two perpendicular plates to form flues through which pass the products of combustion by an indirect draft to or from an ash pit base or ash receptacle. These require a flat grate and cylinder to be arranged on top of the base, the latter extending upward. These differences are entirely overcome by a novel and very ingenious construction.

Improved Vapor Bath.

Samuel A. Miller and Uriah L. Shaffer and John Beal, Lone, Iowa.—This invention has for its object to furnish a vapor bath apparatus which shall be comparatively inexpensive and capable of folding into very compact form, so as to occupy little space and be conveniently handled or transported. To this end the frame is jointed and hinged in a peculiar way, and covered with oil cloth, enameled leather, or some equivalent material, which is made in sections or parts, attached by means of pins so that it may be readily applied to, or removed from, the frame.

Improved Heating Apparatus.

Thomas H. Price and Theodore F. Wade, La Fayette, Ind.—This invention relates to a portable receptacle for containing and heating or keeping hot roasted peanuts, chestnuts, etc. It is formed of a sheet metal bucket or vessel, provided with a handle and having a perforated diaphragm with a conical centrally projecting tube, thus forming a compartment above the plate or partition for the reception of the nuts, and a smaller one below, in which is placed a lamp to supply the required heat.

Butter Mill for Working and Reworking Butter.

Alexander May, Jeffersonville, Ind.—This invention relates to means whereby butter may be more thoroughly worked or reworked without manipulation, and in an easy, convenient manner. It serves to thoroughly work out the water and milk, thereby greatly improving the color and quality of the butter, which is solidified and condensed so that it can be packed for market without any apprehension of spoiling, but with perfect confidence that, after transportation and the lapse of considerable time, it will be sweet and in fine condition, bringing the highest price of the market.

Improved Saw.

Charles D. Lothrop, New York city.—The teeth are like any ordinary cross-cutting teeth, except that they are beveled a good deal more to make sharp knife edge points for cutting off the fibers nicely, and they are set by bending them outward a little near the points. They are arranged in groups of four or thereabout, and between each group is a planing clearing tooth, filed square to the saw plate and arranged on a pitch, by which it is adapted to plane out the stuff cut off but left in the kerf by the other teeth. In front of each planing tooth is a wide notch for clearance, with the bottom beveled acutely to the saw plate, so that the dust kept in the notch, while passing through the log, by the walls of the kerf, will shoot off at the side as soon as it emerges from the log. By thus arranging the teeth, the saw is rendered equally as useful for cutting one way of the grain as the other.

Improved Hog Pen.

Patrick Burke, Malone, N. Y.—This invention relates to a hog pen which is so constructed as to offer protection from cold to the animals; and it consists in dividing the pen into two compartments by means of a partition wall, which is provided with self-closing doors opening in opposite directions, and operated by the pigs, so as to enable the same to pass from one compartment into the other. The invention further consists in applying to the side walls of the compartment employed for sleeping purposes a series of strips, which are placed at such distances apart from each other as to form spaces for permitting the young pigs to enter the space in the rear of or between the fender plates, so as to prevent being injured or crushed by the senior members of the pen.

Improved Sash Pulley.

Amos Halladay, Westfield, Mass., assignor to Duane D. Griffin, of same place.—This invention is a sash pulley face plate, formed of the series of conjoined disks, each of the same diameter, the end ones centrally perforated, and the middle ones having one common slot, so that, with an auger, the plate may be inserted in the window frame, while the pulley will require no special mortise.

Improved Stretching Machine for Bed Bottoms, etc.

Henry D. Goldsmith, New York city.—The object of this invention is to furnish better facilities than now exist for stretching canvas bed bottoms, skins, leather, and all similar materials or articles, for drying or other purposes. A central block or plate, supported by stanchions, is attached to the bed frame, and a post, confined in the center of the block, carries upon its lower end a disk. There are holes in this disk, and cords attached thereto at one end. The other ends of these cords pass through eyes and take hold of the edge of the article to be stretched. The cords, being attached to the canvas and passed through the screw eyes, are attached to the disk eyes, which are opposite and nearest them. It will be seen that, by giving the disk a turn or partial revolution, the cords will be drawn taut, and the article be stretched equally from the center. The disk is revolved by means of a key or lever on the top of the post. When sufficient tension is given the cords, the disk is held in position by means of a ratchet wheel on the post and spring pawl on the block.

Improved Machine for Assorting Potatoes.

David A. Banker and Amos R. Banker, Schaghticoke, N. Y.—This machine consists of long rollers, a hopper, assorting board, and grading chutes, so combined and arranged that, the potatoes being shoveled into the hopper at one end and caused to run along the assorting board and the rollers, the smaller potatoes will escape between the roller and assorting board, while the larger ones will be discharged at the end. The distance between the roller or rollers and the assorting board increases from the head toward the tail, and the potatoes escape through the space, varying in size in the same measure, so that they can be separated into two or more grades by suitable partitions in receptacles below. The assorting board is adjustable toward and from the roller, so as to change the grade at will.

Improved Mold for Casting Glass Letters.

Theodore H. Banks, New York city, assignor to himself, William H. Banks, and James E. Till, of same place.—The mold, which is made of and in two parts, hinged to each other at one end. In one part is formed a recess of such a size as to contain a die, in which is formed the mold of the letter or other object to be cast. In using the device, the mold is heated to such a temperature that it will not cool the melted substance, which is poured into the recess, too quickly. The plunger is then forced into the recess, pressing the melted substance into the cavity of the die. In this way, by having a number of dies, which are comparatively inexpensive, a variety of letters or other small objects may be cast with the same mold.

Improved Weft Stop Mechanism for Looms.

Thomas Isherwood and William Nuttall, of Westerly, R. I., assignors to National Fancy Woolen Loom Stop Motion Company, same place.—This invention relates to looms having guard wires to rise up in the lathe behind the weft thread to hasten the action of the weft fork or feeler for raising the latch when the weft is present to prevent throwing off the shipper lever. The invention is more particularly an improvement on that for which the inventors obtained letters patent No. [illegible]. It consists of a cam on the cam shaft, a bell crank, and a rock lever combined with said wires for operating them; and it also consists of an arm connected to the rock lever which carries the latch and feeler arranged relatively to the wire, so that immediately after the feeler has performed its function, the lathe strikes said arm, and by it moves said rock lever and the latch and feeler out of the way of the lathe at the moment of beating up. It also moves the rock lever, which throws off the shipper lever whenever the weft is not present, and it is caught by the latch. The invention also comprises a novel arrangement of devices by which the rock lever, which the latch acts on to throw off the shipper lever when the weft is not present, is connected to said shipper lever.

Improved Wagon Rack.

Joseph Bolt, Warsaw, Ind.—The object of this invention is to furnish to farmers an improved fodder rack, by which corn and other fodder may be easily and rapidly unloaded from the wagon. The invention consists of a tilting frame, on which the load is placed and firmly retained by suitable uprights and a binding pole, and which frame is pivoted to one side beam of a rack, and locked to the other by suitable mechanism. The tilting of the frame and depositing of the load are performed by taking off the binding pole, unlatching it and lifting it by means of a handle and foot lever off the rack, and swinging it to the side of the rack into a vertical position.

Improved Whiffletree.

George R. Edwards, Galena, Ill.—This invention relates to that class of whiffletrees in which means are employed to release therefrom the traces in cases of a runaway or other accident, so that the horse will at once leave the vehicle, thus preventing its fracture or the injury of its occupants.

Improved Charger for Stoves.

John H. Mahrenholz, New York city.—Stoves are now supplied with fuel in small quantities, through a door opening in the side above the grate, or, in larger quantities, through a cylinder opening at the top. In either case, the fuel is conveyed to the stove in a hod or other analogous receptacle. A frequent escape of gas and dust, much noise, and considerable labor attend the operation, which are in a great degree avoided by this invention. The same consists in a magazine of cylindrical or other suitable form, having a combustible bottom, which may be filled with coal before being placed in the stove, and thus, when said bottom is burned out, the coal will feed downward till entirely consumed. A filled charger is then substituted for the empty one, and this operation repeated as often as is requisite, or so long as the fire is to be kept up. The chargers may be used in any kind of stove adapted to receive them and are provided with a cover having a handle by which to carry or transport them.

Improved Machine for Cutting Iron and Steel.

Carlos M. Robinson, Nyston, Iowa.—This invention relates to the peculiar construction of hand shears for cutting metal, so that either angular or round bars or bolts may be severed with the same knives, and to a novel mode of combining the means for actuating the two cutters, so as to produce a compact and handy tool.

Business and Personal.

The Charge for Insertion under this head is $1 a Line.

Wanted, for Cash—An Engine Lathe, 20 to 24 inch swing, new or second hand. Address, with description and price, W. M. Preston, Monticello, Jones County, Iowa.

For Inventors—Book and Documents showing how to make money on Patents. Plain directions and practical advice for selling meritorious inventions. Send stamp for circular and synopsis of contents. E. E. Mann & Co., cor. Linden Av. and Hoffman St., Balt., Md.

Chemicals, Drugs and rare Minerals used by manufacturers, constantly on hand and sold by package and quantities to suit, by L. & J. W. Feuchtwanger, Chemists, 55 Cedar St., New York.

Waterproof Enameled Papers—all colors—for packing Lard and other oily substances, Chlorite of Lime, Soda and similar Chemicals, Cartridges, Shoe Linings, Wrapping Soaps, Smoked or Dried Meats, and Desiccated Vegetables, Shelf Papers, and all applications where absorption is to be resisted. Samples on application. Crump's Label Press, 75 Fulton St., New York.

Wanted—A Situation as Foreman in a first class Door, Sash, and Blind Shop. Address Box 163, Arlington, Vermont.

Machinist's Grindstones in iron boxes, prices reduced. J. E. Mitchell, Philadelphia, Pa.

Any one interested in machine, brass foundry, or japanning work, see advertisement signed Machinist, on last page.

Best Philadelphia Oak Belting and Monitor Stitched. C. W. Arny, Mf'r, 301 Cherry St., Philadelphia, Pa.

Wanted to know who builds J. A. Reed's Patent Oscillating Engines. Address H. G. Wagner, Box 821, Georgetown, D. C.

Fine Machinery Oils.—We believe that E. H. Kellogg's Spindle, Engine, Signal and Cylinder Oils, although costing a little more per gallon, are really the most economical for the consumer, for the reason of durability and freedom from injury to machinery. If parties requiring oils will make known the uses for which they are wanted, he will not only guarantee satisfaction, but that the goods shall prove precisely as represented. These oils are not only largely used and deservedly popular throughout the United States, but have considerable demand for export, from foreign manufacturers and agents.

H. Y. Crockett, Bath, Me., wishes information concerning the preparation of oil cloths for car linings.

Parties making band resawing machines, send prices to Cairo Box and Basket Co., Cairo, Ill.

Wanted—A mechanical draftsman, well recommended, experienced in designing wood working machinery. For a permanent situation, address Lock Box 296, Hamilton, Ohio.

Amateur Astronomers can be furnished with good Telescopes at reasonable prices. For particulars, address L. W. Sutton, Optician, Box 218, Jersey City, N. J.

"Foot Pen."—The proper address is No. 7 Murray St., New York, not 21. See adv., page 189.

For descriptive circulars, and terms to Agents of new and saleable mechanical novelties, address James H. White, Newark, N. J., Manufacturer of Sheet and Cast Metal Small Wares.

Recutting Old Files—New process—From 50 to 75 per cent saved. Send 25 cents for receipt to A. Edmunds, Flint Center, Ill.

Manufacturers of Brick Machinery, send Circulars to J. Brennagh, 2011 Lafayette Av., St. Louis, Mo.

For Sale—A beautiful Horizontal Steam Engine, almost new, five horse power, built to order for an amateur. Address F. Meigs, Box 2,737, P.O., N. Y.

Best Grain Cleaner ever introduced to the public. State and County Rights for Sale. Agents wanted. Patented October 29th, 1872, by F. Provost, Little Chute, Wis., who may be addressed for particulars.

Wanted—A 2d Hand Steam Engine and Boiler of about ¾ H.P. Must be cheap and in good order. Address Geo. L. Lemson, LaFargeville, Jef. Co., N. Y.

10 H.P. splendid Baxter Engine, but little used, good as ever. I. H. Shearman, 45 Cortlandt st., N. Y.

A responsible firm, having a large and centrally located store in Boston, well adapted for exhibition of machinery and manufactured goods, would like the New England agency of some well established Manufacturing Company or firm whose goods are introduced and favorably known. Address Reed & Brown, 26 Kilby St., Boston, Mass.

The best Gold Pens, for all purposes, are made by C. M. Fisher & Co., 102 Fulton St., New York.

Self-Cleaning Lard and Butter Cutter. Sample 50c. Agents wanted. Wm. H. Stanley, Verplanck, Westchester County, N. Y.

One No. 4 Root Blower for Sale. Price $225. Used two years. In good order. L. H. Sternbergh, Reading, Pa.

Engines, Boilers, Pumps, Portable Engines (new & 2d hand). I. H. Shearman, 45 Cortlandt St., N.Y.

Soluble Glass, Silicates of Soda and Potash, manufactured by L. & J. W. Feuchtwanger, New York.

Patent for a cheap constructed Wash-mangle for sale. Address H. T. & Co., 8 Frankfort St., N. Y.

Wanted—The Superintendency of a Foundry and Machine Shop. Can extend the business in the line of Blast Furnace, Pumping, and heavy machinery in general. Address J. [illegible], Philadelphia, Pa.

Bar Lead—Machine made, of Extra Soft Lead, each bar exactly 8 oz., put up specially for the jobbing trade. Bailey, Farrel & Co., Pittsburgh, Pa.

Nickel Salts and Anodes for Plating, sold by L. & J. W. Feuchtwanger, New York.

Scale in Steam Boilers—how to remove it. Address Geo. W. Lord, Philadelphia, Pa.

Automatic Wire Rope R. R. conveys Coal Ore, &c., without Trestle Work. No. 61 Broadway, N. Y.

A. F. Havens Lights Towns, Factories, Hotels, and Dwellings with Gas. 61 Broadway, New York.

Steam Traps and Boiler Scale Preventive, A. G. Brooks, 426 Walnut St., Philadelphia, Pa.

Johnson's Universal Lathe Chuck—Absolutely protected from dirt and chips. Lambertville Iron Works, Lambertville, N. J.

Pat. Double Eccentric Cornice Brake, m'f'd by Thomas & Robinson, Cin., O. Send for Circular.

Rue's "Little Giant" Injectors, Cheapest and Best Boiler Feeder in the market. W. L. Chase & Co., 93, 95, 97 Liberty Street, New York.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

A Superior Printing Telegraph Instrument (the Selden Patent), for private and short lines—awarded the First Premium (a Silver Medal) at Cincinnati Exposition, 1872, for "Best Telegraph Instrument for private use"—is offered for sale by the Mercht's M'f'g and Construction Co., 50 Broad St., New York. P. O. Box 496.

Woolen and Cotton Machinery of every description for Sale by Tully & Wilde, 20 Platt St., N. Y.

Steam Engines—Special Machinery, Shafting, Pulleys & Hangers. D. Frisbie & Co., N. Haven, Ct.

Dean's Steam Pumps, for all purposes; Engines, Boilers, Iron and Wood Working Machinery of all descriptions. W. L. Chase & Co., 93, 95, 97 Liberty Street, New York.

"Superior to all others"—for all kinds of work—Eliot & Co.'s French Files. They are better forged, better cut, better tempered, and cheaper than English files. Send for Price-List. Homer Foot & Co. Sole agents, 20 Platt St., New York.

Price only three dollars—The Tom Thumb Electric Telegraph. A compact working Telegraph apparatus, for sending messages, making magnets, the electric light, giving alarms, and various other purposes. Can be put in operation by any lad. Includes battery, key and wires. Neatly packed and sent to all parts of the world on receipt of price. F. C. Beach & Co., 263 Broadway, cor. Warren St., New York.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro., 414 Water st., N. Y.

Parties needing estimates for Machinery of any kind, call on, or address, W. L. Chase & Co., 93, 95, 97 Liberty Street, New York.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

For best Presses, Dies and Fruit Can Tools Bliss & Williams, cor. of Plymouth & Jay, Brooklyn, N.Y.

All Fruit-can Tools, Ferracute, Bridgeton, N. J.

Teleg. Inst's and Elect'l Mach'y—Cheap Outfits for Learners. The best and cheapest Electric Hotel Annunciator—Inst's for Private Lines—Gas Lighting Apparatus, &c. G. W. Stockly, Sec., Cleveland, Ohio.

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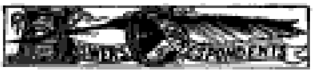


G. E. C. and others will find the correct definition of a Billion, etc., in Webster's "Dictionary."—C. P. L. will find an explanation of black spots in the vision on p. 203, vol. 29.—E. J. will find instructions for transferring prints to wood blocks on p. 139, vol. 28.—F. W. D. should consult a maker of musical instruments.—G. O. will find directions for polishing wood on p. 282, vol. 29.—H. E. will find full instructions for making parchment paper on p. 209, vol. 29.—A. R. M. will find directions for drawing an ellipse on p. 283, vol. 29.—D. H. S. will find a good recipe for black ink on p. 299, vol. 29.—F. D. can plate articles with silver, without a battery, by following the instructions on p. 315, vol. 29.—G. T. can try fastening rubber to tin with the paste described elsewhere on this page.—J. M. S. can cement meerschaum by the process described on p. 235 vol. 29. Cleaning copper coins is described on p. 171, vol. 29.—M. W. is informed that the direction of the earth's rotation is the same all over the globe.—L. R. S. should write to the Hackney Scientific Association London, England, for a copy of the paper about ozone.—C. R. B. will find directions for gilding on black walnut on p. 75, vol. 28. See our advertising columns as to scroll saws.—A. W. is informed that the bolt cutter is patented. He should address the inventor.—I. H. is informed that we have not heard of the casting process which he alludes to.—J. B. S. is informed that gold becomes brittle when cooled too quickly. For directions for annealing it, see p. 299, vol. 29.—P. L. will find a recipe for bottle sealing wax on p. 251, vol. 29. For a cheaper article, increase the proportion of resin.—G. B. F. should advertise for practical information about making wintergreen oil.

C. W. B. says: I am about to build a small frame house, and would like to know how to construct the walls so as to make it warmer than the usual weatherboarding and plastering will do. Is there any better way than to fill in between the weather boards and lath, with one course of brick laid in cheap mortar? A. There is no better way than the one you suggest, and the bricks may be laid on edge; but it is better to use good rather than cheap mortar, and flush it in against the timbers, etc. It is usual also to lay a thin strip of board, nailed at the ends, in the brickwork at about every 3 feet in hight, to stay it.

C. R. M. says: I see it stated that ordinary wood saturated with crude petroleum becomes as lasting as cedar. Is that so? A. A sufficient length of time has not elapsed since petroleum has been used to settle this point definitely, but it is highly probable that its preservative power would be great.

F. C. A. says: I have a house to paint, with slated roof and a piazza all around it. What paint ought I to use, that I may take the water from the roof of my piazza into my cistern for family use? Would it be safe to use lead paint, if the water is filtered through brick before being pumped for use? A. The best paint for your tin roof is Rochelle ocher, in linseed oil; the wash from the vertical boarding of the house will probably be too little to make it a matter of importance, as to whether lead or other paint is adopted.

T. D. H. asks: 1. Will you give me a recipe for skeletonizing leaves, etc.? A. See p. 215, vol. 29. 2. What will deaden the echoing sound in a room? The dimensions are 30x60 feet. Some people recommend building a gallery. My theory is that the walls must have a faced surface. Am I not right? If not, what is the best and cheapest mode? A. On p. 235, vol. 29, we answered a correspondent in reference to the echo developed in a building very similar to yours. By consulting that article, you will find an answer to your question, both in regard to the best method of changing the character of the surface of the walls, and also as to the effect of inserting a gallery.

W. E. M. asks: Can I make pure carbureted hydrogen or coal gas by heating coal to a white heat in an oven of brick, with sheet iron bottom, and (for purification) passing it through heated iron tubes? A. You can make carbureted hydrogen gas in the way you mention, but only from bituminous coal. You cannot purify it in the way you indicate. It is purified by "scrubbing" with water, and passing through lime and sometimes oxide of iron. The present price of gas in New York is from $3 to $4 per thousand feet.

W. C. McM. asks: Which is best to paint the outside of a church with, pure white lead or the best of the chemical mixed paint? A. If you are careful to obtain a pure white lead, you will certainly have an excellent paint. If you decide to take some prepared paint, you cannot be certain as to the ingredients, and may be deceived, so that the white lead would seem to be the best.

J. H. B. asks: Is there anything that will take the stain of nitric acid out of marble, without injury to the marble? A. As the stain is merely superficial, rub with another smooth piece of marble, using water, until removed, and afterwards polish with tripoli, followed by putty powder, both being used with water.

H. asks: How much gum opium is 1 grain of sulphate of morphia equal to, in medicine? A. ⅙ of a grain of sulphate of morphia is said to be equal as a dose of medicine to 1 grain of opium, but it is evidently unsafe to experiment personally with these substances without the advice of a physician. The statement about the separation of hydrogen is utterly false.

W. H. C. asks: 1. What is the best application to preserve metal maple sugar sap spouts, that will not injure the sugar? A. Galvanize the spouts. 2. If galvanizing will do, how is it done? A. By immersing in melted zinc, which is kept covered with powdered sal ammoniac. 3. How is iron wire coppered? A. By immersion in a solution of blue vitriol. 4. What is the most durable paint for a farm wagon? Would you recommend red lead? A. For books, see our advertising columns.

E. C. W. asks: What is the common method of manufacturing lead pipe? A. The metal, heated to a semi-plastic condition, is forced by a press of great strength through an orifice, within the mouth of which a core is set. The complete pipe, having an exterior diameter equal to the orifice, and an inner diameter equal to the core, then issues in one continuous piece, to a length equal to the quantity of metal first placed in the press.

E. M. W. says: My feet break out in sores, like poison from ivy, only much worse. I have known several similar cases caused by woolen socks colored green, and I suppose it must proceed from arsenic. A. The arsenical colors are poisonous, and the effect you speak of might have been caused by it. It would be well to submit a specimen of the dyed wool to a chemist for analysis.

A. S. asks: 1. What are the principal substances that lampblack is made from? A. From tar and resins. 2. What is common clothes starch made from, and does it contain anything detrimental to its use as food? A. From potatoes, and should contain nothing detrimental when properly made.

J. H. H. asks: 1. How can I make good gun cotton? A. By steeping dry clean cotton for a few minutes in equal measures of concentrated nitric and sulphuric acids, washing and carefully drying by hot water, not warmer than 150° Fah. 2. Will it explode from concussion, or only on same conditions as powder? A. It will sometimes explode from concussion. 3. What is its relative expansive force compared with common gunpowder? A. In general, it is found that 11 lbs. of gun cotton occupying 1 foot of space produces a greater force than 33 or 35 lbs. of gunpowder filling the same space, and having a force required for ordinary artillery.

S. & B. ask: 1. Is a patch put on the inside of a boiler stronger than one put on the outside, both being put on with rivets? A. Ordinarily it would be. 2. What is the best thing to put on yellow pine fence posts to keep them from rotting? How would it do to paint the portion that goes in the ground with hot coal tar? A. The plan you mention is in very general use.

F. O. P. asks: 1. How does a turbine water wheel receive its power, by percussive force at the first entrance of the water, or by the reactive force of the water as it leaves the wheel at the discharge points? A. In general, a turbine wheel acts in both ways. 2. Can the same amount of power be got by a draft tube, placing the wheel half way between head and fall? A. If the draft tube is properly constructed, there will not be much difference.

J. F. S. asks: 1. When measuring the hight of the column of mercury in a barometer, shall I measure each inch, beginning at the surface of the mercury in the cup, thus making the inches somewhat shorter than the standard inch? A. You should take the hight in standard inches. 2. With what shall I coat the parts of an article which I do not wish to plate? A. With wax. 3. How can I give brass a dark olive appearance, such as is sometimes put on optical instruments? A. Use vinegar and sal ammoniac. 4. How can I give it a silvery appearance, as is seen on the backs of thermometers? A. Make an amalgam of mercury and silver, rub it on the article to be silvered, and then volatilize the mercury by heat. 5. How can I tan large skins with the hair on, and buckskin without the hair? A. See p. 311 vol. 24, and pp. 139, 308, vol. 28.

A. & B. ask: Of what size should an oscillating engine be, to run an iron boat 20 feet long? A. Cylinder 3x3 inches.

M. asks: 1. Can any incombustible substance be mixed with anthracite coal so as to economize its use? A. We do not know of any. 2. Is anthracite coal injured by remaining in water or by exposure to the water? If so, what changes take place? A. Yes. A slow combustion takes place, and frequently some of the combustible constituents are washed out. 3. If a steam fire engine at the foot of a hill has a pressure on the engine of 80 lbs. to the inch, and the hight of the hill is sufficient to cause the water at the bottom press 20 lbs. on the hose, what pressure in the engine will a pressure of 80 lbs. on the delivery nozzle at top of the hill require? What will be the pressure on each end of the hose when the water is at rest? What will be the pressure on engine and hose when the engine is discharging a stream of half an inch of water from the nozzle on the top of the hill with a force equal to 80 lbs. to the inch? A. See article on "Friction of Water in Pipes," p. 115, vol. 29.

J. K. asks: How must I treat asphaltum so that when spread on a surface it will remain adhesive, become somewhat elastic, and not crack? A. Try heating the surface before applying the asphaltum.

C. H. M. asks: It is stated that aluminum is now cheaply produced by M. Deville, who had charge of the private laboratory of the Emperor of the French, and that he discovered a process by which it can be obtained in large quantities, and at as low a price as silver by weight. Is this the process described in your paper of January 17? A. We believe this process was not as successful as had been anticipated, and that aluminum was produced in Paris, by Deville, so that it could be sold for about twice the price of silver by weight. 2. What is the best and most specific work treating exhaustively of electricity and magnetism? I wish a book that not only treats of manipulation, but of all the correlative facts appertaining to these forces. A. Watt's "Dictionary of Chemistry," and Ure's "Dictionary of Arts and Manufactures" cover the ground. 3. Can dynamical electricity be converted into statical? A. Yes. 4. Can you charge a Leyden jar from a chemical battery in any way? A. A Leyden jar can be charged from an induction coil. 5. Are the nickel five cent pieces pure nickel? If not, what is the alloy? Where does the government procure the nickel from to make them? A. They are composed of nickel and copper. 6. Is there any other finished railroad in Mexico besides the one from Vera Cruz to the City of Mexico and Puebla? A. Not that we know of. 7. At the Cincinnati water works in 1860, they were putting in a new engine with a cylinder 100 inches in diameter, said to be the largest ever made. It was to operate in a peculiar manner. Was this engine a success, and is it in operation now? A. Perhaps some of our readers in that locality will answer this query. 8. What do they mean out west by a ton of ore? Do they mean the weight of 2,000 lbs. or the bulk of 50 cubic feet? A. A ton is 2,000 or 2,240 pounds, according to the terms of agreement. 9. I observe you spell this ton with a u. Do you mean a tun weight or bulk? A. See Webster's Dictionary.

S.—For compass bearings of the sun and meridian altitude, see almanac.

J. S. M. asks: 1. Please tell me if an air pump will lift water 8 feet, forming a good vacuum? A. You can readily lift the water this distance. 2. Would not the old fashioned pump, with a valve in the plunger, lift water at 200° Fah.? A. A piston pump would do better. 3. Does the use of a blower help to make clinkers in the boiler furnace? A. Generally it does. 4. Can there be any greater vacuum than the pressure of the atmosphere, 14·5 or 15 lbs.? A. No.

H. & M. say: We had a new cylinder, 16 x 30, put on an old engine bed plate; it has been working badly. On taking off the steam chest plate and comparing the valve with the ports and exhaust, we found that, when the port was 1-32 of an inch open, the exhaust on the opposite end (or port) was open full ¾ of an inch. We put pieces in the valve to close the exhaust, which left the exhaust open ½ of an inch, when the opposite port was open 1-32 of an inch. The engine had been running 80 revolutions per minute, and we put her down to 70 revolutions. Will you please tell us if we did right in closing the exhaust, and also what motive the makers could possibly have in making the valve to work in that way? A. We think the change effected an improvement. An examination of the valves of steam engines often shows quite as faulty construction as is indicated in the present instance. These cases can best be accounted for by supposing that the manufacturers were careless or ignorant.

N. J. asks: 1. Is ground bone used for hardening purposes? If so, what is principally hardened by it? A. It is sometimes used for case hardening iron, etc. 2. Is there any substitute for it? A. Leather, horns, hoofs, may be used instead.

J. P. says: To dissolve copper by sulphuric acid, it is directed to first oxidize the copper in a reverberatory furnace. Does the addition of nitrate of potassa to the sulphuric acid obviate the necessity of calcination, or previous oxydization? A. Copper can be dissolved in strong sulphuric acid, by the application of heat.

W. H. N. asks: How can oily cotton waste be cleansed for re-use? Can the oil be extracted and purified? A. Bisulphide of carbon is used to extract grease. The volatile bisulphide can afterwards be distilled off and recovered, leaving the grease behind. For practical details, consult some good chemist.

M. H. K. asks: Under the same circumstances, which has the most friction, an eccentric or a crank, with the same frictional surface, stroke, load, etc.? A. The friction would be the same in both cases. For answer to your other question, address the editor of the paper in question.

H. H. says: In a work by Mr. R. A. Proctor, entitled "Light Science for Leisure Hours," it is said that: "A distinguished French astronomer, author of one of the most fascinating works on popular astronomy that has hitherto appeared, remarks that a man would be looked upon as a lunatic who should speak of the influence of Jupiter's moons upon the cotton trade. Yet, as he proceeds to show, there is an easily traced connection between the ideas which appear at first sight so incongruous. The link is found in the determination of celestial longitude." Please explain how this connection between the motion of Jupiter's moons and the cotton trade may be traced. A. The relative positions of Jupiter's moons, when correctly determined, might enable the mariner to determine his longitude, and this again, by diminishing the risks of ocean navigation, would influence the price of articles transported across the sea.

G. F. V. asks: Will plaster of Paris and althea root (marshmallow), mixed with water, stand much heat after setting? A. It ought to stand a temperature 40° higher than the boiling point of water without injury.

W. H. asks: What shade of blue glass will show best at night, at 1,000 feet distance? Common blue glass does not show blue at that distance. A. Try cobalt blue glass.

N. H. says: I have heard that a certain part of the full grown intestine of a cow, or even of a hog or a horse, can be used for the purpose of curdling milk for cheese making. Can you tell me what part of which animal can be best used for this purpose? A. There are various substances which, when added to milk, cause it to coagulate or form a curd. Such are the vegetable and mineral acids, and neutral, earthy, and metallic salts. Rennet, or the stomach of the calf, however, seems to be almost exclusively used and preferred by dairy farmers, but the stomach of all other sucking quadrupeds possesses the same properties. We have little doubt that the application of practical chemistry to cheese making would give the farmer a much more suitable and cheaper substitute. To prepare rennet, the stomach of the calf should be freed from the outer skin, fat, and useless membranes, washed, treated with brine or dry salt for a few hours, and then hung up to dry. When well prepared, the dried "veils" "somewhat resemble parchment in appearance. For use a piece of the requisite size is cut off, and soaked for some hours in whey or water, and the whole added to the milk. Two square inches from the bottom of a good "veil" are said to be sufficient for a cheese of 60 lbs. We are inclined to think that your imported rennets have not been properly prepared, or have become spoiled by long keeping.

E. S. Y. asks: Can I get a patent in Canada for an invention patented in the United States in 1867? A. In Canada, patents are not granted for devices that have been patented in another country for more than one year. For prices of copies of patents, see our advertisement on another page.

W. F. K. asks: How can I produce a current of cold air to pass through a tube 2 feet in diameter and 12 feet long, laying in a horizontal position, the current to move at the rate of 10 miles per hour? A. By the use of a fan or rotary blower.

J. J. R. says: I claim that, in shooting game on the wing, if the gun is held directly on the game and moved with a uniform motion, the shot and game will meet every time. My opponent claims that if you do not shoot ahead of the game far enough to have the game meet it, you will surely miss. A. Your opponent is right. In the act of firing, if the muzzle of the gun requires to be moved at the rate of one foot per second in order to follow the game, and the game is moving at ten feet per second, it is obvious that the shot will not reach the game. The gun must therefore be aimed in advance of the game.

B. J. T. asks: What is the best transparent solution for fixing paper upon glass? A. Try a solution of the best isinglass in glacial acetic acid.

A. W. D. asks: 1. How can I make the best balloon gas? A. The best balloon gas is hydrogen, which is made by dissolving zinc in oil of vitriol diluted with five times its bulk of water. 2. What is the lifting power per cubic foot? A. A cubic foot of hydrogen weighs about [illegible] grains, a cubic foot of air weighs [illegible] grains, and the lifting power is proportional to the difference. 3. Is it explosive? A. When pure it is not explosive, but when mixed with air, it is.

J. B. V. asks: How can I remove the so-called conferva, the green stuff, from my brown stone stoop? A. Try soda lye. Low orders of vegetable growth frequently select cool and shaded localities. The dust is full of plant germs, which no sooner effect a lodgment than they begin to grow under favorable circumstances of temperature and moisture.

E. T. D. asks: 1. How can I make a bichromate battery, using a carbon cell? A. Take gas carbon (from old gas retorts) and shape it into suitable plates with an ax. It destroys the teeth of saws. 2. How can I make carbon cells? A. Dissolve bichromate of potash in water and add oil of vitriol until the solution is strongly acid. Put the carbon plate and this solution into a cup of porous earthenware. Stand this cup in a jar containing a strip of zinc and dilute oil of vitriol. Connect the zinc and carbon with copper wire.

M. B. S. asks: Is there any transparent cement or varnish that diluted sulphuric acid will not affect? A. Try a solution of [illegible] parts of india rubber in [illegible] parts of chloroform, to which, after the india rubber has been dissolved, [illegible] parts of mastic have been added.

O. A. F. asks: How can I put a perforated metal plate into the steam dome of my boiler to break the foam? A. Try wire gauze, arranging some clamps to hold it.

J. H. M. asks: 1. What is the best method of extracting the strength from powdered nut galls? A. The best mode is to loosely stop a funnel with a piece of cotton wool, and fill it half or two thirds full of powdered galls. Then cover over the funnel, but not quite airtight. Ether is poured upon the powder, and after some time a liquid runs through into a receiver placed below. It consists of two distinct strata: the lower, which is almost colorless, is a very strong solution of nearly pure tannic acid in water; the upper consists of ether holding in solution gallic acid, coloring matter, and other impurities. The carefully separated heavy liquid is placed to evaporate over a surface of oil of vitriol in the vacuum of the air pump, and yields the tannin. The water comes from the ether, which usually contains a small [illegible]. 2. Is there a liquid antimony? A. There is no liquid antimony, but there is a compound of chlorine with antimony, the bichloride of antimony, which becomes liquid when slightly heated, and is called butter of antimony. It may be formed by dissolving antimony in hot muriatic acid, or by dissolving sulphide of antimony in hot strong muriatic acid and distilling the product. 3. Could I press a bale of hay with compressed air, and what size of piston head would it require to get power enough, having a jack at each end of press? A. You could not use air, because air is compressible; and by so much as you increased the pressure on the piston, the volume of the air would be diminished.

S. P. asks: 1. Are there any Bessemer steel castings made in this country? A. Yes. 2. Can they be forged, worked hot, punched, and tempered? A. Yes.

E. P. F. asks: How can I make imitation coral? A. Color prepared chalk with sesquioxide of iron or rose pink, pass through a sieve, and make into a paste with white wax.

C. M. L., H. D. M., and many others ask: How can rubber boots be mended? A. Cut a patch out of rubber, and rub the patch and the boot with sand paper. Dissolve a little pure rubber in turpentine to the thickness of molasses; smear the patch and boot five times with this, letting dry each time; then smear once more and press together.

W. H. D. asks: 1. Is the quantity of rain and snow fall constant in every year, or is there as much again in some years as in others? About how many feet altogether fall in a year? A. The average quantity for any locality is about the same, varying greatly in different places. For instance, the average annual rain fall in London is [illegible] inches, and at St. Domingo, 150 inches. For answer to your other questions, address a manufacturer.

D. R. T. asks: What part of the rim of a flywheel goes the fastest? A. The outside part. Your other questions are not sufficiently explicit to enable us to answer them.

C. H. M. says: Given a strong glass tube, filled with water and hermetically sealed, in which are introduced two electrodes, connected to a battery strong enough to decompose water. The battery is set to work. There being no room for the resultant gases, will the decomposition cease, will the two gases under the pressure reunite and form water again, or will the tube burst? A. Not only tubes of strong glass, but balls and cylinders of thick iron may be burst by the accumulated pressure of the liberated hydrogen and oxygen, which neither recombine to form water under this great pressure nor are condensed to a liquid state. 2. Draper says, in his "Textbook of Chemistry," p. 349: By placing a piece of platinum in nitric acid of a specific gravity of 1·35, and then bringing an iron wire in contact with it, and withdrawing the platinum, the iron assumes a passive or allotropic state. It now exhibits no tendency to unite with oxygen, cannot precipitate copper from its solutions, and simulates the properties of platinum and gold." This seems to me an interesting fact, but it is very brief. What induces this change and what is the rule governing it? How much platinum would it require to allotropize a pound of iron? A. There are various modes of producing this passive condition of iron in an acid of a moderate degree of concentration; some of these seem to indicate an intimate connection with its voltaic relations, as, for example, the experiments which you quote. The production of the passive state does not depend upon the relative quantities of platinum and iron, but upon the strength of the acid in which they are immersed and the circumstances under which they are brought into contact. Iron which has been ignited, and is therefore covered with black oxide, likewise is passive, although, on account of the greater thickness of the coating, the passive state is more complete. This would make it highly probable that the explanation is still simpler than that of some voltaic relation, and that the passive condition is due to the formation of a thin film of an hydrous sesquioxide on the surface of the iron. Your other question is too large to be discussed in these columns.

J. J. K. says: A neighbor took out a patent in [illegible], and soon afterwards died. His widow has never done anything with the patent, which is now 17 years old. A. Patents granted in [illegible] expired 14 years from date, unless renewed before expiration, and cannot be revived after expiration except by special act of Congress.

A. B. C. should apply to dealers in photographic materials for the book of instruction in the art.

C. F. W. asks: Can you inform me by what means felt hats can be made flexible, so as to admit of being pressed into a different form? A. Try moistening them.

O. S. asks: If lime be added to fuel, will it intensify the heat of the fire? A. No.

G. R. E. asks: How is an interrupter, which closes and opens the battery circuit as often as the fork vibrates, about 300 times per second, constructed? A. An interrupter or circuit breaker generally consists of a spring, one end of which is attached to one of the poles of an electromagnet, and the other end armed with a piece of soft iron, and kept by the spring a short distance from the pole, but free to be attracted by it when a current passes through the magnet. Sometimes a toothed wheel is used, in contact with a metal spring in connection with the battery.

H. J. D. asks: Do you know of any work that treats on gravel walls, the manner of mixing, building, etc.? A. There have been several works of the kind published; one of the latest is a "Treatise on Concrete," by Henry Reid, C.E. 2. What are the proportions of lime and gravel or gravel and sand? A. See answer to J. L. C., p. 138 of this volume. 3. What would be the proper thickness of walls for a two story house? A. For an ordinary dwelling house, 12 inches would be sufficient. 4. Are the walls considered strong? A. As strong as brick or stone when good cement and sharp sand are used. 5. To what extent are they fireproof, as compared with brick or stone walls? A. They are quite as much fireproof as brick or stone.

W. J. B. says: I am running a [illegible] inch circular saw, which is a little concave on side next the timber. It has what is called the chisel tooth, square in front and on back, but it has to be filed in a way which makes all other saws run out of the timber. It runs too much in the timber when filed square. Does the concave next the timber make it run in? How can I remedy it? Should it be convex next the timber? A. It is almost impossible to make two saws that will hang just alike on the same mandrel, or make the same saw hang alike on any two mandrels. The slightest difference in turning up the collars of the mandrel, or in the holes of the saw near the mandrel hole, will cause a very perceptible difference in the hanging, so that it is often necessary to adjust the saw by packing between the collars with writing paper. In hanging a new saw, it is best to fit it on, screw it up between the collars, and then examine it carefully on the front or log side, and see if the face of the saw is flat. If it is found to be rounding on the log side, cut a ring of writing paper, about half an inch wide, the size of the collar on the outside, oil it, and stick it on the face of the fast collar around the outer edge. Then cut another ring of paper of the same width, making the outside of the ring the size of the hole in the loose collar; put this small ring between the loose collar and the saw, and screw up the collars. If the two rings are not enough, put in more until the saw comes right. If the saw hangs dishing on the log side, reverse the rings of paper, that is, put the small ring between the saw and the fast collar, and the large ring on the loose collar. Should a saw run a little out of true on the rim, it may be made to run true by packing with writing paper between the saw and fast collar. A saw concave on the side next to the log is sure to cause it to run into the timber. It should be perfectly flat on the log side and convex on the board side. For a book of information as to how to run circular saws, send to Emerson, Ford & Co., Beaver Falls, Pa. It will be furnished free.—J. E. E., of Pa.

V. T. asks: What chemical compound will take fire at about 150° to 200° Fahrenheit, without danger of violent explosion? A. Phosphorus.

J. B. says: 1. Frequently small patches of quicksilver are found removed from the backs of looking glass plates; with what material can these patches be covered almost instantaneously, so as to answer the purposes of commerce, and how is it applied? Tin foil has been suggested. A. Clean the damaged spot by very careful rubbing with fine cotton until there is no trace of grease or dust; then with the point of a knife cut the size of the required piece off the silvering of another glass; a small globule of mercury (the size of a pin's head for a surface the size of the finger nail) is dropped upon the cut piece. The mercury penetrates as far as the cut, and allows the piece to be removed. It is then gently pressed on the spot with a piece of cotton. 2. How can cast and sheet iron stoves be best preserved from rust, on being put away for winter's use? A. By packing in well burned, perfectly dry, coarsely powdered quicklime, or by coating with black lead, or by boxing up as nearly airtight as possible along with quick lime, in a dry place. Your other queries relate to trade matters.

G. A. J. asks: Is air the heaviest during a rainy, damp time, or when it is clear and cold? A. It is the heaviest in a cold, clear day.

P. asks: 1. Is there an invisible ink for writing on postal cards? A. A dilute solution of chloride of cobalt; on gently heating, the writing is developed. 2. Is there any invisible ink that will become visible by the application of water? A. We believe not.

J. W. H. asks: 1. How can I change the color of brass to copper? A. It cannot be done directly. The object, however, can be effected by a very thin coating of electroplated copper. 2. How can I give brass or copper a bright color, after it comes from the foundery? A. By exposing for a short time to dilute *aqua fortis*.

P. says: In making a hydrogen lamp, I poured the commercial acid and water (1 to 4) into the jar, when bubbles began to appear upon the zinc; but after a couple of minutes, the acid ceased to work. I then procured some "chemically pure" sulphuric acid and put that into the jar with the same proportion of water, but it had no effect upon the zinc. The zinc was common sheet zinc, rolled into a roll. What was, probably, the cause of the failure? A. Our own experience is that commercial sheet zinc dissolves in oil of vitriol and water (1 to 4) with great rapidity. Try altering the proportions you employed until you hit the point of greatest action. There is no advantage in substituting pure for commercial sulphuric acid.

C. M. asks: How should paint be mixed to be applied to a mixture of glue and glycerin? A. Try grinding up oil paints with a thick hot solution of common soap.

E. A. F. T. asks: Can elm, pecan, and white oak trees, from 12 to 30 inches diameter, be sawn up for wheelwright's use with a 36 inch circular saw driven by a 4 horse power engine? How much timber, board measure, can be sawn with such a saw and power in a day? A. A 36 inch saw would be rather too small for timber 30 inches in diameter. A 56 inch saw would do better, and a 4 horse power engine would drive it well enough; such a saw, well managed, would cut from 4,000 to 6,000 feet board measure in each 10 hours.—J. E. E., of Pa.

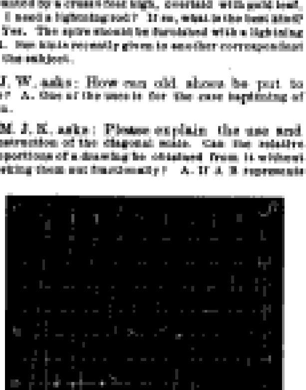
W. E. asks: Does it take as much to support a man of 180 lbs. weight in the water as it would to support the same weight of iron or other heavy substance? A. No. 2. Do any of the ocean steamships carry life rafts? If so, what kind are they? A. Some of them do. We believe both the Monitor and Nonpareil rafts are used. In answer to your other question, consult a lawyer.

C. P. asks: How can I bend a piece of rosewood ¼ inch thick, 2½ inches wide, and 41 inches long, in a circle without breaking it, to lap 2 inches? A. Try steaming it.

C. C. E. says: I am building a church spire to the hight of 166 feet from the ground. It is surmounted by a cross 8 feet high, overlaid with gold leaf. Do I need a lightning rod? If so, what is the best kind? A. Yes. The spire should be furnished with a lightning rod. See hints recently given to another correspondent on the subject.

J. W. asks: How can old shoes be put to use? A. One of the uses is for the case hardening of iron.

M. J. K. asks: Please explain the use and construction of the diagonal scale. Can the relative proportions of a drawing be obtained from it without working them out fractionally? A. If A B represents one unit of measure, as one foot, on any required scale each of the divisions A a, a b, b c, etc., represents 0·1. Divide A C into 10 equal parts, and draw lines through each division parallel to A B. Draw also diagonals, A 1, a 2, b 3, etc. Then the distances, from A C, to the points of intersection of the diagonals with the horizontal lines, represent hundredths. For instance, 0·45 is the distance b e of the intersection of the horizontal line b b, and the diagonal f 1—0·93 is the distance m n, and so on.



MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated:

R. T. B.—Stones are so altered by exposure to fire that it would be necessary to see the mineral before fusion in order to pronounce what it is. We know of no separate treatise on charcoal burning.

H. S.—Your specimens are iron pyrites.

R. S. W. A.—Iron pyrites. For directions for silvering mirrors, see p. [illegible], vol. [illegible]

W. W.—It is metallic iron.

C. H. M. asks: Is there any means by which I can filter the heat out of sunlight, and converge the light rays into a focus afterwards, without having any heat in the focus?—B. F. K. asks: What metals are used to make Yankee brass, and what are the proportions of each?—F. S. asks: How can I stick india rubber on rough and polished brass, so that kerosene oil will not loosen it?—C. M. asks: How can I soften a meerschaum pipe, which has become hardened by too rapid smoking and will not color? What will remove the incrustation from the inside?—W. H. D. asks: If the foundation of the centennial tower gave way ½ of an inch on one side, how much would it throw it out of perpendicular at top?—T. A. E. says: In polishing a wooden knob, I laid a piece of worn sand paper on the palm of my left hand, held the knob in my right hand, and moved it rapidly on the paper in a circle of about two inches, from right to left. The paper began immediately to rotate with a regular motion from left to right. The movement of the paper was much slower than that of the knob, though well defined and continuous while the friction lasted. Can any of your readers explain this?—A. S. asks: How is stamping done on goods for embroidery or braiding?—J. F. W. asks: How can I make a good imitation meerschaum pipe?—F. J. Q. says: What cement will make a tight joint between iron and wood?—L. C. D. asks: What can I do to keep hens from eating their eggs?—L. L. E. says: A sealskin cap became greasy and I removed the grease with ammonia and alcohol, but it left the fur without gloss. How can I restore the gloss and remove the kinks in the fur?—J. W. M. asks: How can I join gun barrels in making a double barreled gun? How can I cut the grooves of a rifle?—J. E. McC. asks: Can any one give me a good recipe for root beer?—W. F. S. P. asks: How many square miles of the earth's surface can be seen from the top of a steeple 400 feet high, supposing the earth to be perfectly spherical and 7,900 miles in diameter?—J. N. W. forwards us for inspection a piece of plank, on one side of which is an excrescence as large as a hen's egg. All over the lump, as over the flat portion of the surface, the saw marks are visible, and the next plank in the log had not the least depression to account for the phenomenon. Our correspondent bored a hole through the lump to see if there were a soft place in it, which would account for the growth by the swelling of the wood, but it is solid throughout. Can any of our readers account for it?—V. T. asks: What is a good composition with which to impregnate a fuse that will burn at about 100 or 200 feet a minute?

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Epicycloid. By M. M.
On Three Challenges to the Students of Nature. By D. L. S.
On Psychic Force. By J. T. C.
On Proving a Theory. By O. E. W.
On Magic Squares. By T. C. S.
On Electricity in Therapeutics. By S.T.W.
On Trades Unions. By N. W. K.
On Landing a Line from a Vessel. By W. H. D.

Also enquiries from the following:

W. W. C.—E. S.—C. E.—S. A. R.—E. B.—C. J.—S. A. M.—F. J.—L. P. C.

Correspondents in different parts of the country ask: Who makes brass and copper tubes, drawn without joints? Who makes sap evaporators? Where can gutta percha be obtained? Where can the mountings and eyepieces for the cheap telescope, described on p. 7, vol. 30, be obtained? Who sells tools used by sculptors in modeling? Who sells German leaf gold? Who makes water and gas pipes? Who sells portable frame dwelling houses? Who makes rock drilling machines and cement drain pipe machines? Who sells peanut roasting machines? Where can glasses for looking down into water be obtained? Who sells machines for crushing seed without stones? Who sells whalebone for whips? Who makes small steel castings? Who makes lozenge cutting machines, to work by hand? Who sells boxwood for engravers' use? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

Several correspondents request us to publish replies to their enquiries about the patentability of their inventions, etc. Such enquiries will only be answered by letter, and the parties should give their addresses.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED IN THE WEEK ENDING

February 24, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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Table, ironing, H. C. Smith	[illegible]
Teas for use, preparing, J. Spratt	[illegible]
Telegraph, duplex, T. A. Edison	[illegible]
Telegraph pins, making, C. O. Ripley	[illegible]
Thill coupling, F. Norris	[illegible]
Thill coupling, L. D. Warren	[illegible]
Thread holder, A. M. Shurtleff	[illegible]
Tool handle, J. J. Cox	[illegible]
Tool holder, N. P. Beadish	[illegible]
Transplanter, A. Baxt	[illegible]
Trap, animal, J. M. Carnahan	[illegible]
Truck, G. W. Bellard	[illegible]
Umbrella drip cup, Lasby & Winter	[illegible]
Umbrella runner, C. A. Thompson	[illegible]
Valve, balanced, W. Stephens	[illegible]
Valve, balanced, slide, E. D. Speer	[illegible]
Vehicle seats, shifting back for, J. M. Landis	[illegible]
Ventilation of cars, etc., J. M. Palmer	[illegible]
Ventilator, car, A. W. Gates	[illegible]
Vessels, holder for, G. D. Dudley	[illegible]
Wagon brake, J. C. Coleman	[illegible]
Wall plaster board, J. M. Cobb	[illegible]
Washing machine, W. H. Taylor	[illegible]
Watch fastener, safety, Bruce & Kirkham	[illegible]
Watch, stem winding, L. Evans	[illegible]
Water and gas cut off, H. Keeble	[illegible]
Water and gas cut off, E. M. Morris	[illegible]
Water stop gate, E. Armstrong	[illegible]
Water tank, self-cleaning, F. Harvie	[illegible]
Well boring apparatus, A. W. Morgan	[illegible]
Wells, fluid injector for oil, S. S. Fertig	[illegible]
Wheelbarrow, J. H. & J. L. Jones	[illegible]
Whip socket, A. Searle	[illegible]
Windlass for presses, etc., M. Bryant	[illegible]
Wringing machine, J. K. Dugdale	[illegible]

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned.

[illegible].—MAKING TUBE JOINTS.—S. J. Hayes. May 13.
[illegible].—STOVE.—J. C. Henderson. May 13.
[illegible].—SEWING MACHINE.—S. T. Holly. May 13.
[illegible].—SKATE.—J. Lovatt. May 13.
[illegible].—CAR WHEEL.—S. F. Smith. May 13.
[illegible].—POLISHING GLASS, ETC.—A. Broughton. May 13.
[illegible].—PAPER BAG MACHINE.—S. E. Pettee. May 13.

EXTENSIONS GRANTED.

[illegible].—SEED PLANTER.—J. S. Huggins.
[illegible].—CAR COUPLER.—E. C. Knight.
[illegible].—FASTENING SAW HANDLES.—J. Neimeyer.
[illegible].—BENDING SHEET METAL.—G. W. Stow.

DISCLAIMER.

[illegible].—SEED PLANTER.—J. S. Huggins.

DESIGNS PATENTED.

7,190.—SODA WATER APPARATUS.—W. Gybon, Bos., Ms.
7,191 to 7,199.—CARPETS.—J. Fisher, Philadelphia, Pa.
7,200.—ORGAN CASE.—L. K. Fuller, Brattleborough, Vt.
7,201.—CARPET.—W. Kerr, Philadelphia, Pa.
7,202.—CARPET.—H. S. Kerr, Philadelphia, Pa.
7,203.—TYPE.—A. Little, New York city.
7,204.—CARPET.—C. Bigelow, Philadelphia, Pa.
7,205.—CRANE.—G. E. Smith, West Fitchburg, Mass.
7,206.—PENS.—S. M. Worthington, Madison, Wis.
7,207.—SCROLL SAW FRAME.—G. Holtzman, Baltimore, Md.
7,208.—CARPET.—T. J. Stearns, Boston, Mass.

TRADE MARKS REGISTERED.

1,643.—WHISKY.—E. Block, Cincinnati, Ohio.
1,644.—WHITE LEAD.—E. S. Browning, New York city.
1,645.—SUGAR CURED MEATS.—G. F. Davis & Co., Cin., O.
1,646.—COUGH REMEDY.—H. R. Gray, Montreal, Canada.
1,647.—WHISKY.—Hoffheimer Bros., Cincinnati, Ohio.
1,648.—YARNS.—W. H. Horstmann & Sons, Phila., Pa.
1,649.—TALLOW AND LARD.—A. Smith & Co., Cincin., O.
1,650.—STARCH.—J. Pyle, New York city.

SCHEDULE OF PATENT FEES.

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CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA.

FEBRUARY 24 to MARCH 3, 1874.

[illegible].—L. S. Johnson and M. J. Johnson, Cortland, Cortland county, N. Y., U. S. Extension of patent No. [illegible], for "Johnson's Beef Compound." Feb. 26, 1874.

[illegible].—E. E. Pearce, New Wandsworth, Surrey county, England. Improvements in the manufacture of glucose or grape sugar from rice and other grain, and an apparatus employed therein, called "Pearce's Improvement in the manufacture of Glucose or Grape Sugar from Rice and other Grain and in Apparatus employed therein." Feb. 24, 1874.

[illegible].—H. Parker, Gananoque, county Leeds, Ont. Improvements in molds for casting cores, called "Parker's Core Mold." Feb. 24, 1874.

[illegible].—H. Hitchcock, Watertown, Jefferson county, N. Y., U. S. Improvements in lamps, called "Forced Blast Heavy Oil Lamp." Feb. 24, 1874.

[illegible].—J. W. Allison, Buffalo, Erie county, N. Y., U. S. Improvements in steam boilers, called "Allison's Steam Boiler." Feb. 24, 1874.

[illegible].—J. E. F. Lüdeke, London, England. Improvements in obtaining and applying motive power and on the machinery and apparatus to be employed therein, called "Lüdeke's Motive Power Machine." Feb. 24, 1874.

[illegible].—T. W. Dowling, Pontiac, Mich., U. S. Improvements on scroll sawing machines, called "Dowling's Novel Treadle Scroll Saw." Feb. 24, 1874.

[illegible].—H. Skinner, Argyle Street, King Cross, London, England. Improvements on the manufacture of gas and apparatus therefor, called "Skinner's Gas Apparatus." Feb. 24, 1874.

[illegible].—S. Hughes, Jersey City, Hudson county, N. J., U. S. Improvements on lanterns, called "Hughes's Improved Lantern." Feb. 24, 1874.

[illegible].—William A. Kirby and D. M. Osborne, Auburn, Cayuga county, N. Y., U. S. Improvements on mowing or grass harvesting machines, called "Kirby's Mower." Feb. 24, 1874.

[illegible].—T. Murgatroyd, Hamilton, Wentworth county, Ontario. Improvements in carriage springs, called "Murgatroyd's Compound Reinforced Carriage Spring." Feb. 24, 1874.

[illegible].—S. Perry, Newport, Herkimer county, N. Y., U. S. Improvements on rotary hay tedders, called "Perry's Rotary Hay Tedders." Feb. 24, 1874.

[illegible].—J. O'Reilly, Oshawa, Ont. Improvements on a machine for washing clothes, called "O'Reilly's Improved Patent Washer." Feb. 24, 1874.

[illegible].—F. A. Everett and M. Bowerman, Springfield, Mo., U. S., assignees of A. W. McClure, St. Louis, Mo., U. S. Improvements in metallic churn dashers. March 3, 1874.

[illegible].—T. S. Huntley, Cardiff, Glamorgan county, Wales, A. Gilchrist, Anstruther, Fife county, Scotland, and J. A. Dixon, Glasgow, Lanark county, Scotland.—Improvements in extracting forest trees and tree stumps by the roots to clear the soil, and in implements and engines employed therefor, such engines being also adapted for rolling down snow and other obstructions to the locomotion of the engine, called "Huntley, Gilchrist, and Dixon's Tree and Stump Extracting Engines and Apparatus." March 3, 1874.

[illegible].—H. Quinlavalle, Brooklyn, Kings county, N. Y., U. S., and E. La Forte, New York city, U. S. Improvements on the construction and arrangement of steam and sailing vessels, called "Quinlavalle's Safety Hoister and Grain Cargo Steadier." March 3, 1874.

[illegible].—M. A. Wier, 3 Great Winchester street, London, England. Improvements on apparatus for registering and checking the entries and exits of passengers to and from tramway cars, omnibuses, or other carriages, called "Wier's Registering Apparatus." March 3, 1874.

[illegible].—A. C. Langworthy, Aurora, Kane county, Ill., U. S., and I. Huntington, London, Middlesex county, Ont. Improvement on spring bed bottoms, called "Double Arch Spring Bed Bottom." March 3, 1874.

[illegible].—T. Emery, Peshtigo, Oconto county, Wis., U. S. Improvements on a machine for rolling logs, called "Emery's Log Rolling Machine." March 3, 1874.

[illegible].—J. Mulley, New York city, U. S. Improvements on machines for melting snow and ice on streets and railways, called "The Snow Annihilator." March 3, 1874.

[illegible].—S. W. Paine, Rochester, Monroe county, N. Y., U. S. Improvements on shot cartridges, called "Paine's Shot Cartridge." March 3, 1874.

[illegible].—C. N. Ross, Claremont, Sullivan county, N. H., U. S. Improvements on horse hay rakes, called "Granite State Horse Hay Rakes." March 3, 1874.

[illegible].—S. W. Jamison, Newark, Essex county, N. J., U. S.—Improvements on machine for crimping leather for boots and shoes, and for crimping other materials, called "S. W. Jamison Crimping Machine." March 3, 1874.

[illegible].—A. B. Costello, Jersey City, Hudson county, N. J., U. S.—Improvements in photographic backgrounds, called "Costello's Pliable Conical Photographic Backgrounds." March 3, 1874.

[illegible].—T. G. Glover, Bedford, Lawrence county, Ind., U. S. Improvements in reapers, called "Glover's Self Raking Reaper." March 3, 1874.

[illegible].—J. H. Westcott, Oneida, Madison county, N. Y., U. S. Improvement on chucks, called "Westcott's Improved Chuck." March 3, 1874.

[illegible].—W. T. Fry, Brooklyn, Kings county, N. Y., U. S. Improvements in combined shutter and window fastener, called "Fry's Combined Shutter and Window Fastener." March 3, 1874.

[illegible].—J. Pommanski, New York city, U. S., and J. S. Bethune, Warrenton, Fauquier county, Va., U. S. Improvement in diaper pins, called "Pommanski Universal Lock Safety Pin." March 3, 1874.

[illegible].—T. De Witt, Grand Ledge, Eaton county, Mich., Improvements on a machine for washing clothes, called "De Witt's Star Washing Machine." March 3, 1874.

[illegible].—J. Johnson, Brooklyn, Kings county, N. Y., U. S. Improvements in ball casters, called "Johnson's Universal Caster." March 3, 1874.

[illegible].—T. E. Bromley, Greenboro, Mercer county, Pa. Improvements on sled brakes, called "Bromley's Sled Brake." March 3, 1874.

[illegible].—W. C. Shepherd, Cleveland, Cuyahoga county, O., U. S. Improvement on check hook guard, called "Shepherd's Check Hook Guard." March 3, 1874.

[illegible].—T. H. White and G. W. Baker, Cleveland, Cuyahoga county, O., U. S. Improvement on street field lamps, called "White and Baker's Street Lamp." March 3, 1874.

[illegible].—J. E. Proctor, Malden, Middlesex county, Mass., U. S., assignee of L. L. Robinson, Salem, Essex county, Mass., U. S. Improved caster attachment to sewing machine tables, called "Robinson's Caster Attachment for Sewing Machine Table." March 3, 1874.

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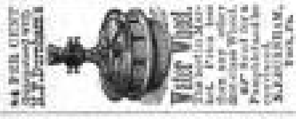

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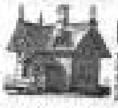

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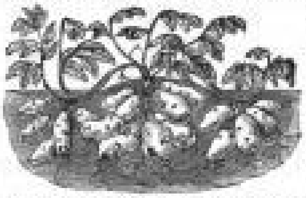

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